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BULLETIN No. 31. 1931. REPRODUCTION SERIES No. 9, VOL. II

BULLETIN
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BOTANY, PHARMACY AND MATERIA MEDICA

CINCINNATI, OHIO

REPRODUCTION SERIES, No. 9, Vol. II

DRUGS AND MEDICINES
of
NORTH AMERICA

By

J. U. & C. G. LLOYD

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A PUBLICATION

Devoted to the Historical and Scientific Discussion of the Botany, Pharmacy,
Chemistry and Therapeutics

OF THE

MEDICINAL PLANTS OF NORTH AMERICA

THEIR CONSTITUENTS, PRODUCTS AND SOPHISTICATIONS

Vol. II.

J. U. LLOYD,
Commercial History, Chemistry and Pharmacy

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CINCINNATI
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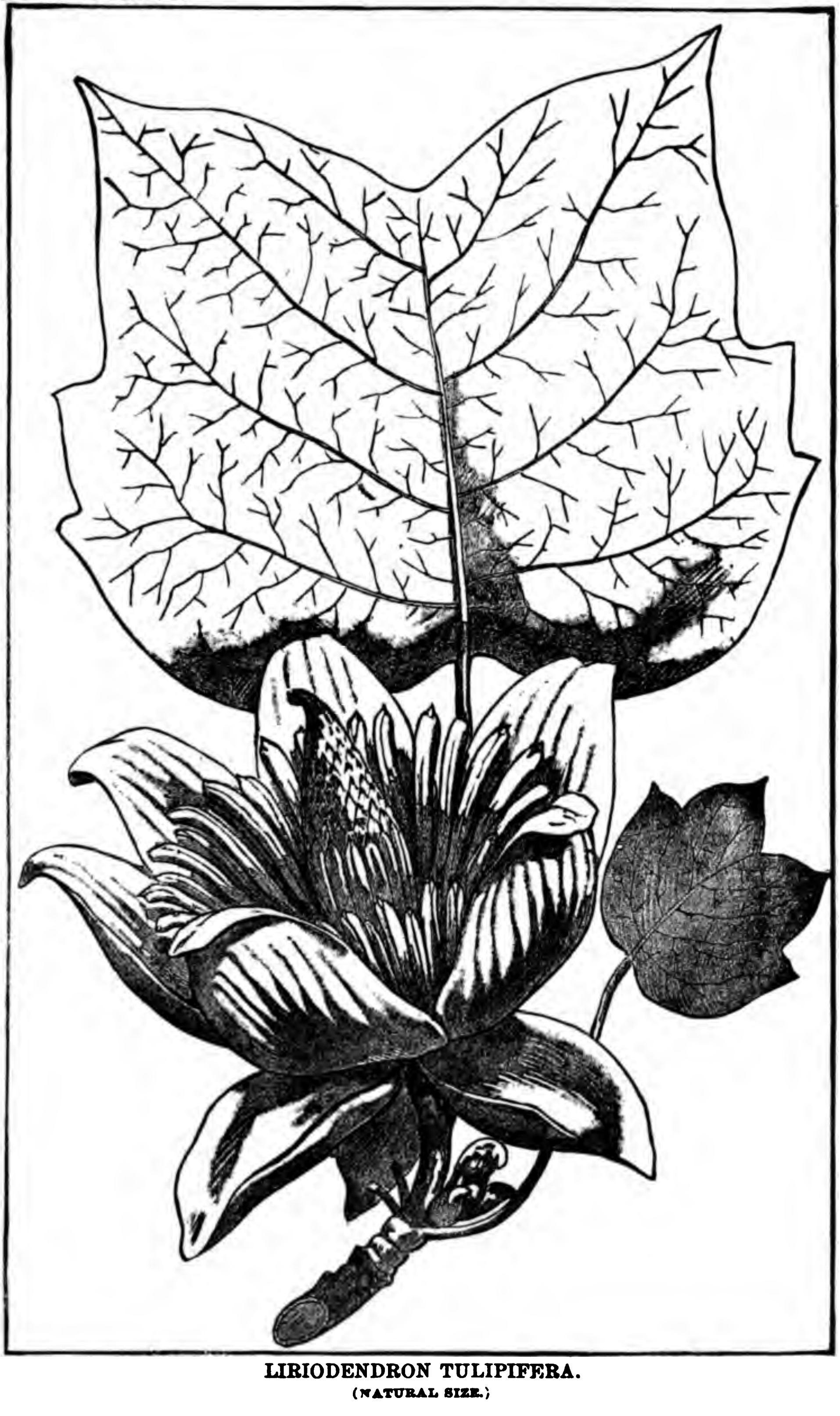
PLATE XXVI.



LIRIODENDRON TULIPIFERA.

(NATURAL SIZE.)

DRUGS AND MEDICINES OF NORTH AMERICA.

VOLUME II.

LIRIODENDRON TULIPIFERA.

TULIP TREE.

PARTS USED.—The inner bark of the stem and the root bark of Liriodendron Tulipifera *Linn.*

Natural Order Magnoliaceæ, Tribe Magnolieæ.

COMMON NAMES.—The name originally applied to the tree by the early settlers was Canoe Wood, from the fact that the Indians made their canoes from the tree.

When introduced into Europe it was under the name Tulip Tree, and, while that is the common name abroad, it is to be regretted that it has been little used in this country. It is very applicable, from the resemblance of the flowers to tulips, and has the sanction of all text-books, including the Pharmacopœia, but the people do not take kindly to the name and it is but seldom used.

In the East, the tree is known as White Wood, and the early French inhabitants of the country gave it the name of Yellow Wood. In the West it is called Yellow Poplar, and in Ohio, Kentucky, etc., where the true Poplar is rare, the Tulip Tree is almost universally known simply as Poplar Tree. Writers on botany have continually protested against this name, because the tree has no relation or resemblance to the true Poplar, but the name will probably always be used. In the drug trade, and by collectors, the bark is always called Yellow Poplar Bark.

The names American Poplar, Tulip-bearing Poplar, Saddle Tree, Lyre Tree, Old Wife's Shirt (the latter three from the shape of the leaves), which are sometimes applied to the tree in books, would not here be mentioned were it not for completeness.

BOTANICAL DESCRIPTION.—The Tulip Tree is a magnificent forest tree, rising sometimes to the height of one hundred and fifty feet, and of all the deciduous trees east of the Mississippi it attains the largest dimensions, with the exception of the Sycamore (Platanus occidentalis). It reaches its greatest development in the rich, loamy, deep soil in the fertile bottoms along the rivers.* In the forests the trunk for from forty to sixty feet is unbranched and perfectly straight and erect, and almost uniform in diameter. The branches above are very regularly distributed, forming a symmetrical open head.

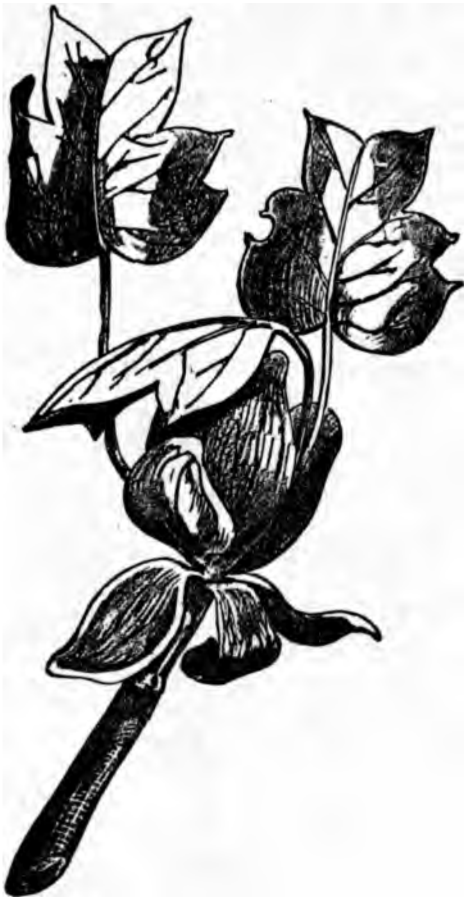


FIG. 106.
An unfolding leaf-bud of Liriodendron Tulipifera, showing the stipular scales.

The leaves (see Plate xxvi.) are of an odd shape, being somewhat of a square outline ; they are nearly equally four-lobed, the side lobes separated by shallow sinuses ; the terminal lobes end abruptly and as regularly as if the leaf had been folded along the mid-rib and clipped with a pair of shears. The lower lobes are generally themselves partially lobed, but the terminal lobes are usually entire. In the large leaves of vigorous shoots of young trees the lobes are narrower and separated by deep, narrow sinuses.

The leaves are borne on angular, narrow foot stalks, about two or three inches long, and quiver with the least wind, and this is probably one of the reasons for calling the tree, Poplar.

The development of the leaves in the bud is peculiar. The buds are for the most part terminal and are covered externally with two thick scales cohering by their edges. These scales open, disclosing another apparent bud, covered by two scales (stipules), cohering also by their edges and forming a sheath. As the bud grows, these scales expand until they become about an inch long, when they open and disclose a young leaf and another similar bud. The leaf is bent on its petiole so that the apex points down and the young blade is folded along the mid-rib with the sides flat together (conduplicate), and lies close beside the next bud. The scales that protect the young leaves are true stipules, and after expanding they perform the office of stipules, remaining attached at the base of the leaf-stalk for some time, generally until the leaves have become full grown. At length the stipules fall away, leaving a circular scar on the young branch above the base of each leaf-stalk. On vigorous shoots of young branches the stipules are tardily deciduous, remaining till late in the summer.

---

*The monarch of all that we have known was destroyed by vandals in 1868. It stood on the banks of the Tradewater river, a Kentucky tributary to the Ohio, and was conspicuous even to thoughtless persons in consequence of its grandeur. A report was circulated that this old "Poplar" was a bee tree, and one Sunday morning a party of men collected, and by their united efforts, after hours of labor, felled it to the ground. Then it was discovered that it sheltered neither bees nor honey, and their only reward was the fact that this magnificent specimen of American forestry was exterminated. The diameter was said to be twelve feet at the base.

The flowers are large and showy and appear in May and June. The tree, when in bloom, is not as conspicuous as would seem probable from the size of the individual flowers, owing to the sombre hue of these flowers and the bright green foliage which obscures them.

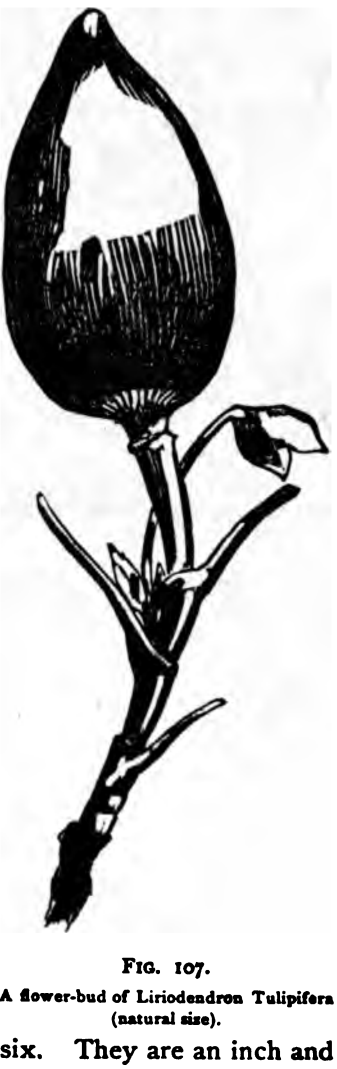


FIG. 107.
A flower-bud of Liriodendron Tulipifera (natural size).

The flower buds are large, and well represented in our drawing. When young they are enclosed in two obcordate scales, notched at the apex, which turn brown and fall off when the bud is about one-half the size here represented. Squirrels are very fond of these young flower buds, and often large numbers of the partly eaten buds are found under the tree, where they have fallen after having been gnawed off by squirrels.

The sepals which are imbricated in the bud are three, and are reflexed in flower; they are about the length of the petals and are green, with a yellowish tinge. The petals are six, in two series; they are concave, and make a cup-shape flower, which in size and form is the same as the common single garden tulip.* The petals are of a fleshy texture; they are of a yellowish green color and striate or veined, and are marked on the inside near the base with a large orange red spot which is somewhat crescent-shaped, and the coloring extends irregularly up the veins.

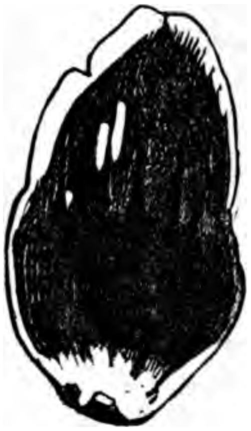


FIG. 108.
An inside view of a petal of Liriodendron Tulipifera.

The stamens are numerous. The natural number, we believe, is six, opposite each petal, or thirty-six in all, and although that is the usual number, they vary by suppression from thirty-two to thirty-six. They are an inch and a quarter long and consist each of a firm filament, one-third the length of the stamen, and of two long shallow anther-cells attached parallel to the outside of the broad filament (extrorsely adnate)[*] and about two-thirds the length of the stamen, as shown in our cut (fig. 109).

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*When the flower is young the edges of the petals slightly lap, forming a perfect cup. As the flower becomes older they spread, as shown in our engraving, which was made from a flower past its prime.

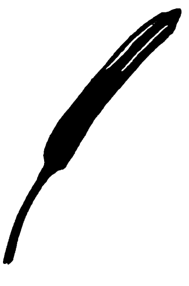


FIG. 109.
Exterior view of a stamen of Liriodendron Tulipifera.

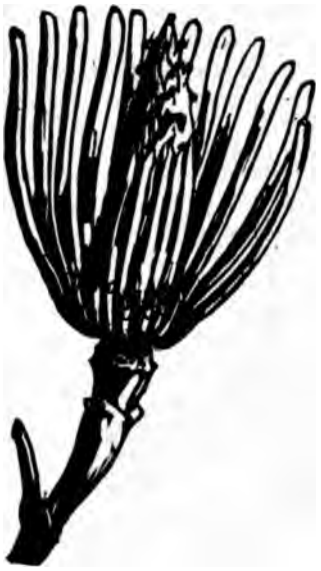


FIG. 110.
The andrœcium and gynæcium of Liriodendron Tulipifera, part of the stamens cut away to show the pistils.

The pistils are very numerous, and are attached spirally to the elongated receptacle, forming a dense conical column in the center of the flower. Each pistil consists of a one-celled, two-ovuled ovary, a broad-winged, flat style and a minute recurved stigma.

The fruit is a large cone, composed of numerous (about seventy) spirally arranged samaras, which, when mature, separate and fall away. The broad, flat wing of the samara enables it to be carried a long distance by the wind. The seeds, which in the greater number of the samaras are abortive, in the fertile fruit are one or two in number and are contained in a small cavity at the base of each samara.

FIG. 111.
A samara of Liriodendron Tulipifera.

GEOGRAPHICAL DISTRIBUTION. — The accompanying map[†] (Plate xxvii.) shows the extreme limits of the Liriodendron tree. The tree is abundant in the Middle States, reaching its greatest development in the Wabash valley of Indiana, Kentucky, Tennessee, and the western slope of the Alleghenies. It is rare in the maritime regions of the Carolinas, and over the greater portions of Georgia, Alabama and Mississippi; also east of the Hudson River and the northern portions of New York.

BOTANICAL HISTORY.—We have a record of the Tulip Tree before the first settlement in America. Thomas Hariot, who accompanied Sir Richard Greenville and wrote a journal of the voyage,[‡] mentions among other economic plants of the new world, "Rakiock," referring to the Tulip tree.[§] Again, Sir William Strachey, who arrived in Jamestown in 1612, five years after its first set-

---

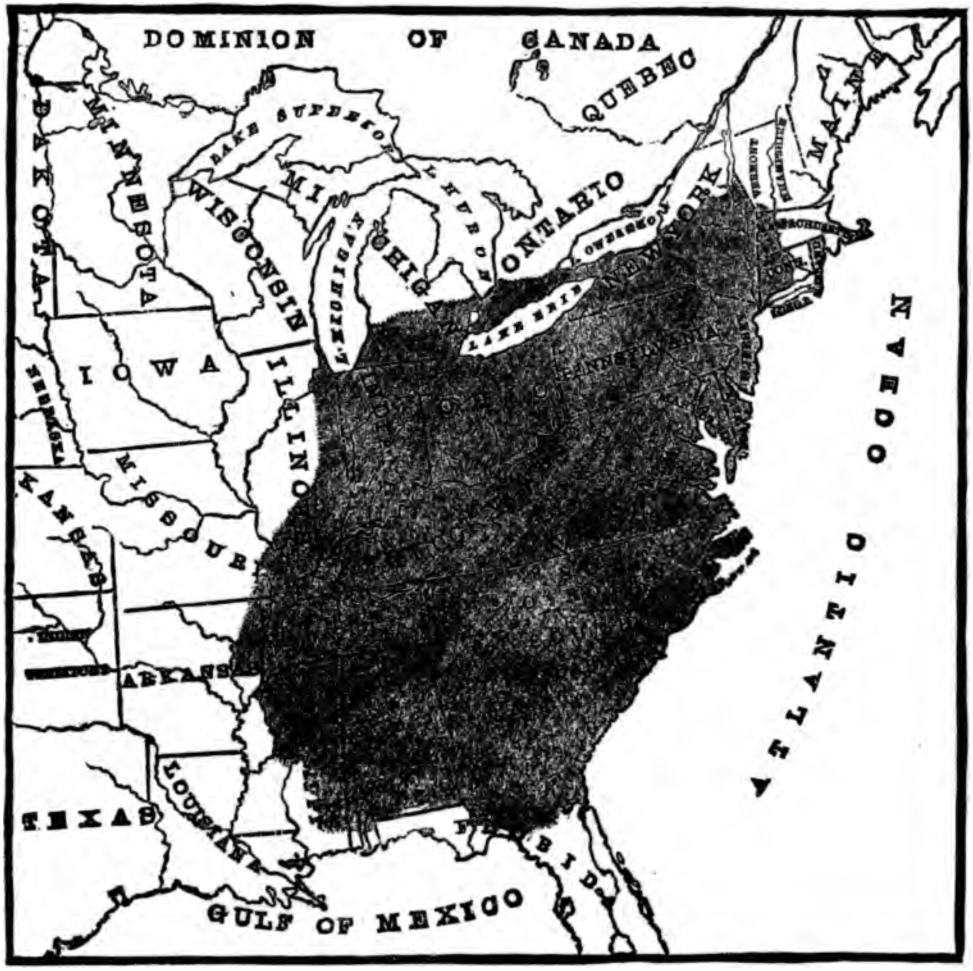
[*] The stamens of Liriodendron being extrorse, present a generic difference between this genus and Magnolia, which has stamens all introrse.

[†] By Chas. S. Sargent, published in the Report of the Forests of North America for the tenth census.

[‡] Published in Latin as Part I. of De Bry's Celebrated Collection of Voyages, Frankfort on the Main, in 1590.

[§] "Rakiock," a kind of tree so called, that are sweet wood, of which the inhabitants that were near unto us do commonly make their boats or canoes of the form of troughs, only with the help of fire, hatchets of stone and shells; we have known some so great, being made in that sort of one tree, that they have carried well twenty men at once, besides much baggage; the timber being great, tall, straight, soft, light, and yet tough enough, I think, (besides other uses) to be fit also for masts of ships."—*Hariot* (translated).

Pickering believes the tree "Rakiock" to be the Tulip tree, and Hariot's description of the wood and uses certainly point to this tree; however, the sentence "that are sweet wood" would not apply to it.



MAP SHOWING THE DISTRIBUTION OF LIRIODENDRON TULIPIFERA.

EXPLANATION OF THE MAP.

While the extreme geographical limit is here shown, the tree is not equally abundant over all the territory. It is rare and of stunted growth in northern New York and east of the Hudson River, owing to the severe winters; near the coast in the Carolinas, and over the greater part of the region south of Tennessee, owing to unfavorable soil.

tlement, mentions it as Whitewood.[*] Thus we have the history of the tree beginning with the history of the country, and it has always received more or less attention in all travels which note the objects on natural history of America.[†]

The tree is supposed to have been taken to Europe by John Tradescant, Jr., about 1656,[‡] although who introduced it is not positively known. It was cultivated, however, as early as 1663, at first as a pot-plant in hot-houses, afterwards it began to be planted in the open air, from which time it came to be extensively grown in open ground throughout Europe, and is now a common tree in that country in cultivation. At the time of Linnæus it was well known.

In old American works on plants, and other works, when it was mentioned it was known under the generic name of Tulipifera,[§] given to it by Paul Hermann (1687).[‖]

Linnæus (1737) adopted the name Liriodendron[¶] for the generic name (spelling it Liriodendrun). It is to be regretted that he did not retain the old generic name, which was more appropriate. When he came to give it a specific name (1754), he selected for it the former generic name and corrected the spelling of the generic name, calling the tree Liriodendron Tulipifera, which name it has ever since retained without synonym, save Salisbury, who called it Liriodendron procerum.

Varieties.—That there are two forms of the tree, distinguished by the amount of the heart wood, was early noticed by lumbermen, and that they are distinct can not, we think, be refuted. Marshall mentions them as early as 1785. Michaux distinguishes two forms with acute and obtuse leaves, which he designated as var. acutiloba and var. obtusiloba, and Rafinesque states that the acute lobed form produces the white wood and the obtused lobed the yellow wood. Late botanical writers, however, take no cognizance of these forms, and while we are convinced that there are certainly two distinct trees as far as the color of the lumber is concerned, we have not been able to determine that they have different shaped leaves.

From an observing farmer,[**] who claims to know the two trees apart by the appearance of the bark, we learn the following:

The Yellow Poplar grows along streams and seems to select a damper location than the White, and the trunk is almost entirely yellow or heart wood, there being but a couple of inches of sap wood on the outside. It is very easy to split, makes good rails, and the lumber lasts a long time.

The White Poplar grows on hilly woods and dry locations, and the trunk is mostly white or sap wood. It is very difficult to split,[††] and decays in a few years, so it has but little value as a timber. He states that the young trees can not be distinguished to his knowledge by the bark, but that the yellow poplar bark of old trees is in long, horizontal ridges, while the white poplar bark is short and choppy.

---

[*] "The Historie of Travaille into Virginia Britannia, by Wm. Strachey" (edited by R. H. Major, and published by the Hakluyt Society in 1849). Strachey says (page 130): "Besides these fruict trees there is a white poplar," etc. Major considers this reference to apply to Populus balsamifera, but Pickering to the Tulip tree, and we have no doubt that the latter is correct.

[†] For valuable aid in studying up the early references to the Tulip tree, we wish to acknowledge our thanks to Dr. Chas. Rice, who has kindly furnished most of our information.

[‡] John Tradescant, Sr., was a German who came to London and established a museum about 1640, almost the first that was devoted to natural objects. Tradescant was not specially interested in botany, but made collections of plants for his museum, along with other objects of nature. His son, John Tradescant, Jr., was sent to America about 1650 (the precise year is not recorded) to make additions to his father's museum. He sent home a large number of new plants and trees, and it is supposed among others the Tulip tree, as it was recorded in several English gardens a few years after his return. The genus Tradescantia, which commemorates both father and son, was first applied to the American Spiderwort by Ruppius in his Flora Jenensis (1718), the plant having been introduced into the garden by Tradescant. Linnæus adopted the name and assigned to the genus several other species.

[§] Tulipifera arbor virginiana, *Hermann* (1687); Tulipifera caroliniana, foliis productioribus magis angulosis, *Plukenett* (1700), (see note ‡ page 247 of Vol. I.); Tulipifera virginiana, tripartito aceris folio, media lacinl velut abscissa, *Plukenett* (1700); Arbor virginiana tulipifera, *Clayton* (in Herb.); Tulipifera liriodendron, *Miller*.

The generic name *Tulipifera* literally means tulip-bearing, from the word *tulipa* and the Latin *fero*, to bear.

The word *tulip* is not a derivative from a Latin word, but from the Persian *dulbend*, or the related *toliban*, turban, in allusion to the expanded form.—*C. Rice.*

[‖] Paul Hermann was a German botanist and physician, who resided in the East Indies for a number of years, and afterwards returned to Europe and filled the chair of Botany in the University at Leyden from 1679 to 1695. He published the catalogue of the Leyden Garden (1687) in which the generic name Tulipifera was first given.

[¶] The name is from the two Greek words *λίριον* a *lily* (a tulip), and *δένδρον* a *tree*.

[**] Mr. Thomas Rouse, Crittenden, Ky.

[††] To use the expression of our informant, "You could n't split it with Jersey lightning."

Whether these two trees differ in other particulars than the amount of heart wood produced, or whether this is the result of the situation where they grow, remains yet to be decided.

MEDICAL HISTORY AND PROPERTIES.—Schoepf, 1787,[*] recognized the bark, root, leaves and seed of the Tulip tree. The bark and root in tincture as a febrifuge and rheumatic remedy; the seed as aperient; the fresh leaves to make an ointment, that was asserted to be useful in inflammations and gangrene. These were undoubtedly the uses that Schoepf found the settlers and American Indians making of the tree, for there is no record of it having been accepted by the medical profession at that day.

Dr. J. T. Young, 1792,[†] addressed a letter to Governor Clayton, of Delaware, stating as follows: "I have prescribed the Poplar in a variety of cases of the intermittent fever, and can declare from experience it is equally efficacious with the Peruvian bark. It possesses the quality of an aromatic, a bitter, and an astringent. I have never known it to fail in a single case of worms. I prescribed it to a child when convulsions had taken place, and after taking several doses, several hundred of dead ascarides were discharged."

Governor Clayton added to Dr. Young's statement that "during the late (Revolution) war Peruvian bark was very scarce and expensive, and as I was at that time engaged in considerable practice, I made a mixture of the barks of Liriodendron, Cornus florida and Quercus alba (white oak) in nearly equal quantities.[‡] This remedy I prescribed for several years, in every case in which I conceived the Peruvian bark necessary or proper, with at least equal, if not superior, success."

Prof. Rush, 1793,[§] published a short notice upon its uses, stating that a mixture of Liriodendron, Cornus florida and Prinos verticillatus[‖] was used by him, with as much satisfaction as any of the bitters of the shop.

B. S. Barton, 1801,[¶] states that "the bark is frequently used in intermittents. Many persons are of the opinion that, in this case, it is but little inferior to Peruvian bark. I have never employed it."

Eberle, 1822,[**] devotes considerable attention to this tree, condensing extensively from preceding writers. He takes exception to the anthelmintic properties, stating, "I have given it for this purpose in several instances without deriving any good effects from it."

Chapman, 1825,[††] adds: "The leaves are much employed in country practice as a topical application, in the headache or fever, and in sprains, bruises, painful rheumatic swellings, etc."

Smith, 1830,[‡‡] states that "It is very successful in jaundice."

Rafinesque, 1830,[§§] states that "the Cherokee Indians use the leaves in poultice for sores and headache, and the ointment of the leaves for inflammation; that the seeds are laxative, and that the extract of the bark is a useful remedy for syphilitic ulcers of the nose."

The New York edition of the United States Pharmacopœia (1830) gave the medical properties of the drugs recognized, and, of Liriodendron tree bark, remarks, "tonic, stimulant diaphoretic. Dose one scruple to two drachms, in powder."

The first edition of the United States Dispensatory accepts Liriodendron as a "stimulant, tonic, with diaphoretic properties. It has been used as a substitute for Peruvian bark in intermittent fevers, and has proved serviceable in chronic rheumatism, dyspepsia, and other complaints, in which a gentle stimulant and tonic impression is desirable."

The early Eclectic practitioners used it but little, and this drug has never occupied a conspicuous position in their materia medica. Prof. John King gives it an important position in his Dispensatory, and Prof. J. M. Scudder, in his "Specific Medication," simply remarks, "it is a stimulant and tonic to the digestive apparatus, improving digestion and blood making. It also exerts an influence upon the nervous system, strengthening innervation and relieving those symptoms called nervous."

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[*] Materia Medica Americana, David Johann Schoepf, Erlangae, 1787, p. 90.

[†] American Museum, Vol. VII.

[‡] Since both Cornus florida and white oak barks are considered by some to be of value as febrifuges, especially the Cornus, it is uncertain as to the part the Liriodendron fills in the mixture.—L.

[§] Transactions of the College of Physicians, Philadelphia, 1793, Vol. I., pp. 183–185.

[‖] Common name Black Alder; now classified by Asa Gray as Ilex verticillata.

[¶] Collections for an Essay towards a Materia Medica of the United States, 1801, Part II., p. 14, (edition 1810).

[**] Treatise of the Materia Medica, Vol. I., p. 279.

[††] Elements of Therapeutics and Materia Medica, Vol. XI., p. 429.

[‡‡] The Botanic Physician, p. 525.

[§§] Medical Flora and Botany of the United States, Vol. II., p. 239.

Thomson neglected it entirely, and we do not find it even named in his Materia Medica, or in the entire series of Thomsonian Recorders, which seems somewhat remarkable, owing to the fact that in many respects its properties coincide with those of the most valued Thomsonian remedies.

The Homœopathic uses of Liriodendron are to be found in the special paper prepared for this publication by Prof. E. M. Hale. See page 20.

Résumé.—Liriodendron is doubtless a tonic and stimulant, and can aid digestion and sometimes relieve dyspepsia. That it has antiperiodic properties is evident, but, unless this country is debarred the more valuable Cinchona bark and its alkaloids, liriodendron will only be a domestic remedy in this respect, unless, as may be possible, its action is of a different nature.[*] When given in substance, there is no reason to doubt that the acrid resin as a mechanical irritant may possess some anthelmintic properties. That the drug has been neglected by the medical profession is undeniable, and careful clinical investigations should establish its exact position. We searched the United States for a physician now employing it, but, excepting Prof. Hale, without success, although we found that in domestic practice it is still occasionally used.

During the late war, the Confederate armies were compelled to resort to such substitutes for Peruvian bark and its alkaloids as were to be found in the Southern States. Liriodendron was conspicuous among the reputed antiperiodics and febrifuges, and became an important drug. Mr. Charles Mohr[†] was prominent as a Mobile pharmacist and chemist, and served some years as chemist in the Confederate Hospital department. He writes us that in the treatment of remittent and intermittent fevers, as an antiperiodic, Liriodendron bark proved very successful.[‡]

PHARMACOPŒIAL HISTORY.—Liriodendron was not admitted to the first (1820) edition of the United States Pharmacopœia. In the 1830 revision, (both Philadelphia and New York), the bark of the tree was recognized. It was carried in the secondary part, an unused drug, through succeeding revisions, until 1880, when it was discarded. There has never been an officinal preparation of Liriodendron. We have just stated in our Medical History that we could not find a record that Liriodendron is now being prescribed by any physician, and by referring to our description of the drug, it will be seen that the bark of the root is by far the richest part of the tree. Therefore we conclude that not only have the Pharmacopœial revisors carried it unnecessarily, but have always recognized an inferior portion.[§]

COMMERCIAL HISTORY.—Liriodendron bark is now sometimes employed in domestic practice as a tonic and rheumatic remedy. It appears in the drug trade in large slabs, consisting of the dried inner bark of the tree. The drug is obtained in the spring when the sap is flowing and the bark separates from the wood easily, by cutting away the outer or corky portion and then peeling off the inner bark in large slabs, generally about six inches wide and three to six feet long.

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[*] Since writing this we have received Prof. Bartholow's physiological investigation of tulipiferine, to which the reader is directed, (on page 18).

[†] Chas. Mohr is one of the most painstaking and deserving botanists of the South. Since the war he has filled several official positions, was in charge of the department of trees and woods for the last census, and is now Agent Division of Forestry (Southern), Department of Agriculture, Washington. He is also a carefully educated pharmacist.

[‡] See Pharmaceutical Preparations, page 12, for the formula employed.

[§] In our opinion, an object of the Pharmacopœia is to recognize among drugs those that are legitimate and are in use by the medical profession, regardless of their value therapeutically. That there are a number of valuable drugs unrecognized in medicine none can doubt, but, until they are accepted, it seems to us that they should not cumber our Pharmacopœia. Upon the other hand, it must be confessed that many inferior crude drugs and their products are extensively employed, and notwithstanding their objectionable features, we believe that our Pharmacopœia should give them positions while they are recognized remedies.

It is not used by any section of the medical profession of America. We corresponded with a number of the foremost pharmacists in each city of the United States, and in no instance did we find a record of a prescription having been received for it. An occasional call for domestic use is the only demand that is reported by pharmacists for the drug.

PHARMACEUTICAL PREPARATIONS.—In domestic practice, infusions and decoctions are sometimes administered, but the usual method is to make a spirituous tincture by covering the recent bark of the tree with whiskey. There is no recognized pharmaceutical preparation.

The formula employed in the Confederate hospitals, as recorded by Mr. Charles Mohr, of Mobile, is as follows:

Compound Fluid Extract of Poplar Bark, Dogwood and Black Willow.—

Bark of Liriodendron Tulipifera, ground.
" " Cornus florida, ground.
" " Salix nigra, ground, each fifty pounds.

Moisten with proof whiskey well freed from fusel oil by rectification through charcoal, and percolate with the same menstruum until sixteen gallons are obtained, reserving the first two gallons of the percolate. The remaining fourteen gallons are subjected to distillation at a low temperature in partial vacuo until ten gallons of spirits of twenty-two per cent. alcohol are run over. To the residuum add twenty pounds of sugar, and evaporate the syrupy liquid to thirty-four pints. Mix before cooling with the reserved tincture to make fifty fluid pints of Fluid Extract.

This extract, of the consistency of a thin syrup, is of deep brown color, at first perfectly clear, showing but a very slight turbidity after a few days' standing; it possesses in a high degree the aroma and taste of Liriodendron.—CHARLES MOHR.

ROOT BARK.—The characteristic part of this tree is the fresh inner bark of the root, although other portions of the tree resemble it in a fainter degree. The freshly broken inner bark of the root is white, and, like the inner bark of the tree, has an aromatic odor. It is intensely acrid and bitter, producing, when chewed, a painful biting sensation approaching to pepperness. Upon exposure the broken bark becomes of an orange color next to the outer bark, and this orange coloration often extends in longitudinal streaks entirely through the inner bark. When water is poured over the fresh bark, and distilled, the distillate contains a small amount of a colorless volatile oil.* This oil has an odor somewhat aromatic, when fresh, intermediate between lemon and bergamot. Upon exposure the fragrant portion evaporates, leaving a distinct turpentine-like odor, but we could not get enough to identify. The oil is neither peppery nor bitter.

The decoction of the bark has a muddy appearance and a somewhat bitter taste, but it is not acrid. Upon standing it deposits a small amount of a buff-colored sediment. Filtration produces an amber-colored clear liquid, and upon the addition of an alkali it changes in color to red. The filtrate gives a precipitate with most alkaloidal precipitants.

Upon drying the bark, some loss of bitterness and of the sharp, pungent, aromatic substances is experienced, but it would require a great length of time to render the bark entirely free from these characteristics, if they ever disappear. The bark that has been boiled with water for a considerable time, and then dried, still contains them. Prof. Maisch states[*] that bark collected by him and kept in a dry place for twelve years without special precaution, has still the characteristic taste in a marked degree.

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*Tilden states five per cent. We could only obtain it in very small proportion.

TREE BARK.—The freshly broken inner bark of the tree and limbs has a white color, and a slight aromatic odor. It imparts, when chewed, at first a bitterness combined with astringency, and then a sharp, biting sensation, less marked than the root bark.[†] When the breath is exhaled through the nostrils, an aromatic impression follows which is dependent upon a volatile oil. Upon exposure the broken inner bark turns of a light greenish yellow.

Distillation of the bark with water gives a liquid that contains some oily-like products, but this is destitute of the rich aroma of the fresh bark. The decoction is destitute of bitterness, and does not respond with alkaloidal tests. It contains calcium salts, an abundance of glucose, and it produces a green color with ferric chloride. The exhausted bark is destitute of bitterness, but imparts a slight turpentine-like flavor when chewed. The biting, peppery principle is destroyed by the boiling, and is neither in the distillate, the decoction nor the exhausted bark.

The leaves are slightly aromatic, of a pure bitter, but destitute of the acridity of the bark.

The mature flower buds are of a turpentine-like odor when recently broken and an aromatic turpentine-like taste, followed by bitterness. They are a favorite food for squirrels.

MICROSCOPIC STRUCTURE OF THE BARK OF LIRIODENDRON TULIPIFERA.—(Written for this publication by Robt. C. Heflebower, M. D.)—On the outside of the bark is the usual layer of cork, consisting of from four to eight cells in thickness. In this layer, the cells are flattened from without in, and on section are three or four times as long as they are wide. This layer is, in some places, thickened, so as to present an increased number of cells, being as much as twelve or fourteen cells through.

The next substance to the cork, and to the inner side of it, is the parenchyma proper of the bark. It is composed of numerous layers of cells, arranged in tolerably regular rows, parallel to the external surface of the bark. The cells of this layer are in immediate relation with the cork layer. Those cells nearest the cork are smaller and of a nearer round form than those at a greater distance from that layer.

At a short distance from the cork, parenchyma being interposed, begins the bast.

In the parenchyma are stone-elements, scattered bast fibres, resin sacs and oil cells.

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[*] National Dispensatory, Third Edition, p. 929.

[†] It contains very much less resin than the root bark, and the acrid nature of the bark is due to this resin.

The stone-cells, or stone-schlerenchyma, are seen scattered sparsely through the parenchyma.

The bast fibres or bast cells that are found in the parenchyma are exceedingly scattered, and lie in bundles of two or three cells each.

The resin-sacs are comparatively few in number, and are not of great dimensions. They occupy the place of two or three cells, are of a tolerably regular round or slightly oval form, and have no regularity of distribution. They do not lie in groups, but are solitary, and are filled with a single drop of resin, or with an aggregation of several drops. The latter is usually the case.

Oil-cells are also found in the parenchyma, though not in any great quantity. They are situated in the outer and middle portions of the parenchyma mostly, though a few are found farther in.

Extending from the cambial zone toward the cork layer, but not reaching the latter, are the bast rays. These terminate by gradually becoming smaller, until they finally end in a single cell. These rays are equivalent, both in size and position, at the cambial zone, to the wood medullary rays, and have the same general course. In this bast zone are sieve-tubes, a few stone-cells, resin-sacs, and scattered parenchyma cells with much bast fibre.

CONSTITUENTS.—Dr. Rogers, 1802, in an inaugural address, Philadelphia, among other ordinary plant constituents, identified a peculiar resin. This was the first analysis made of the bark.

Prof. John P. Emmet, 1831,* next made an examination of the bark, failed to find an alkaloid, but decided that the resin of preceding investigators was largely composed of a crystalline substance that he named liriodendrin. Others in common with ourselves have since failed to obtain this substance in crystalline form, and as brief abstracts only of Prof. Emmet's process are usually made, and the Journal containing his original publication is now seldom to be obtained, it is important that it should be again accurately recorded. Hence we produce it *verbatim*, as follows:

"The bark is to be stripped from the roots, dried, and finely pulverized; it is to be steeped for several hours in cold alcohol. The fluid, when saturated, is to be removed, and fresh portions added until the bark becomes exhausted. By employing the alcohol, hot, and straining forcibly through a fine cloth, this result will be accomplished. The alcoholic solutions are next to be filtered and transferred to a large retort, or alembic, and heated until at least two-thirds of the fluid have been recovered by distillation. Toward the end of the process, the impure liriodendrin will separate and collect at the bottom in large semi-fluid masses; it may be readily obtained by pouring out the contents of the vessel and allowing the whole to cool. The remaining liquid is then to be gently evaporated in an open vessel until it assumes the consistency of honey. The temperature should not exceed two hundred degrees.

"This dark resinous-looking mass is to be incorporated with the portion which separates during the distillation, and then triturated with a warm solution of caustic potassa, soda, or aqua ammonia. The alkali removes a large quantity of coloring matter, and the liriodendrin. being insoluble, separates, and may be brought together by a spatula. This treatment with caustic alkali must continue until the solution passes off colorless. The liriodendrin in this state has a drab color, which becomes lighter by exposure to soft water, and a waxy lustre. At a temperature of 30° F. or 40° F. it is hard and brittle, but softens in the hand, and bears a close resemblance to putty.

"The peculiarities of this substance prevent us from obtaining it crystallized from hot concentrated alcoholic solutions. If such a solution be examined with an eye glass, it will appear saturated with exceedingly minute globules. The liriodendrin merely separates as a transparent varnish; water seems necessary for its crystallization, and in this state there is great reason for believing that it is hydrated. The water, however, should be added gradually until the color of the solution becomes pearly white, and the temperature should be as low as 40° F. or 50° F. The crystals obtained in this manner and by spontaneous evaporation are very pure, but always present different forms, among which may be observed triangles, and rhomboidal plates, interspersed with plumose or stellated prisms; some of these are frequently limpid, while others have the micaceous appearance of boracic acid."

Emmet says that "liriodendrin in alcoholic solution is very bitter, leaving a sensation of heat upon the tongue, and burns with a brilliant white flame, giving much soot, like resins and oils. When liriodendrin is fused, it bears a close resemblance to a soft resin," and "to conclude, I may observe that the properties of liriodendrin seem to place it with camphor, as a connecting link between the resins and volatile oils."

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* American Journal of Pharmacy, 1831, p. 5.

It will be observed that Prof. Emmet is not very decided regarding the nature of the crystals, and that he finally refers the substance to the resins and volatile oils.

Griffith, 1847,[*] seems to doubt its nature, for he states that it can scarcely be considered as a peculiar principle, "but is rather a compound body, consisting of a resin and a volatile oil."

Tilden, 1860,[†] ignores liriodendrin in his analysis, but names besides the usual constituents of plants, resins, oil, and bitter matter. He claims five per cent. volatile oil, but we, from several distillations, obtained very much smaller amounts.

Wallace Procter, 1872,[‡] failed to obtain Emmet's crystals, although he obtained the resin in globules.

It seems that all commentators accept Emmet's work excepting Tilden and Procter, who made examinations of the drug, and Tilden, failing to crystallize the liriodendrin, said nothing. Hence, it is to be expected that in most works following Emmet's, the active principle of the bark will be recorded as a crystalline substance, liriodendrin. We shall refer to this subject more carefully in another place.

According to our examination, the characteristic principles, aside from the ordinary constituents of plants, are a bitter extractive, volatile oils, resin, coloring principles and an alkaloid. The aroma of the fresh bark depends upon the volatile oils; the acridity upon the resin; the bitterness (especially of the green leaves) upon the bitter extractive matter; the coloring matter and the alkaloid are not perceptible to either taste or smell.

Oleo-resin of Liriodendron.—Exhaust the undried fresh bark of the root with alcohol, spec. grav. 0.820, and distill off the alcohol, having previously added one-fourth its bulk of water. After cooling, add to the residue its bulk of water, and permit the mixture to rest for twenty-four hours in a cool location. Decant the overlying liquid, wash the resinous precipitate well with water and triturate the insoluble residue with alcohol. Filter, evaporate the alcohol, and then dissolve the residue in concentrated ether in considerable excess. After some days filter and evaporate the ether. By this process much of the volatile oil is lost.

Description.—This amber-colored turpentine, or oleo-resin, is sticky and viscid at ordinary temperatures, being somewhat thicker than Venice turpentine. It has a specific gravity of 1.096, an acid reaction, and the acrid taste of the bark. Upon exposure to the air for a great while in thin layer, it becomes hard and loses most of its aromatic odor.

It dissolves freely in chloroform, benzol, concentrated sulphuric ether and in alcohol, and although it is a mixture of resinous bodies and their oxidation products, it can not be disintegrated by the action of the usual solvents. We were unable to crystallize it at any temperature, or to obtain a crystalline product from it, by spontaneous evaporation or otherwise.

Solution of caustic potash dissolves it to a considerable extent, and by repeated treatments with successive portions of a hot solution it all dissolves. The addition of an acid in excess then precipitates the resin acid, with loss of its volatile oil and the aromatic odor, but with the acrid nature unimpaired. There evidently are also some decomposition products that are not at present of interest. The altered resin from the precipitated potash solution refuses to crystallize.

Cold sulphuric acid turns oleo-resin of liriodendron red, then brown; heated sulphuric acid chars it, and then effervescence follows. Cold nitric acid acts upon it very slowly; heated nitric acid decomposes it with effervescence and the production of a red liquid. Neither hot nor cold muriatic acid affects it.

Resin of Liriodendron.—This may be obtained somewhat altered by washing the oleo-resin of liriodendron with weak potash water and then dissolving the residue in sulphuric ether, filtering, and evaporating the ether. By this operation the oils are separated from the resin, which is less soluble in alkaline liquids. The resin is of a strong acrid taste, especially in alcoholic solution.

Resin of liriodendron is described by Prof. Emmet, (Liriodendrin) obtained from dried liriodendron root, as a putty like mass that crystallizes by spontaneous evaporation from alcoholic solution, to which water has previously been added until it becomes turbid. We used every endeavor to obtain crystals by this and other processes from the resin of the fresh bark, but without avail. At times it appeared as though we had been successful, but a critical examination demonstrated that the product was in amorphous micaceous layers; often nearly needle-like spurs appeared, transparent in thin layers, but no crystals. It could not be decolorized by animal charcoal, and neither microscopically nor otherwise, in large or small amount, could we produce a single crystal. This resin agrees in character with the crude oleo-resin, excepting that it is of somewhat firmer consistence and devoid of aromatic odor, as would seem probable from the loss of volatile oil. We are certain that only as a decomposition product, or an exceptional freak, can a crystalline resinous substance be obtained from the fresh liriodendron bark.

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[*] Medical Botany, 1847, p. 100 He seems not to have made it, however, but to draw his conclusions entirely from Emmet's paper.—L.

[†] Journal of Materia Medica, 1860, p. 163.

[‡] National Dispensatory, third edition, p. 929.

This resin is the "Liriodendrin" of Prof. Emmet, who has recorded in positive terms that a substance obtained by him from dried liriodendron root bark, crystallized in acicular needles and in micaceous plates. We can not dispute his testimony, but, although we obtained by his process and the use of dried liriodendron bark, his putty-like substance, time and time again, in abundant amounts, we could not crystallize it. (See page 14 for Prof. Emmet's process.) It produces a resinous body that is an alteration of the resin of the fresh bark, slightly soluble in cold alkaline solution, and of firm consistence like hard putty, of a gray, ashy color as separated from the aqueous potash solution, but of dark brownish-red from re-solution in alcohol and subsequent evaporation. It agrees with the description of Prof. Emmet excepting in formation of crystals; dissolves in alcohol, ether, chloroform and benzol, and will yield at times micaceous nodules, but, as before stated, no real crystals appeared to us. In small amount it appears transparent; in larger bulk, colored. Solutions of this resin were evaporated and examined microscopically, but no crystals could be obtained.*

Prof. Virgil Coblentz made solutions of this putty-like resin, as furnished by us, and endeavored to crystallize it by Prof. Emmet's process, and otherwise, but failed. Prof. F. B. Power intended to make an ultimate analysis of this resin (liriodendrin of Emmet), but, after examination, agreed with us that it was not a definite substance and that an analysis would not be of value.

Alkaloid of Liriodendron (*Tulipiferine*).—The mixed watery liquid and residues from the washed resin is acidulated with hydrochloric acid, evaporated to small bulk, ammonia added to render it slightly alkaline, and the mixture agitated with sulphuric ether; the ether is decanted, and the residue is again treated with ether; the ethereal liquids are mixed, one-third their bulk of water added, and then a slight excess of hydrochloric acid; the ether is distilled, and, after cooling, the residue is filtered.

This aqueous solution still contains some impurities and should be again rendered alkaline; extracted with ether; water and hydrochloric acid added as before; the ether evaporated and the residue filtered. This will produce a colorless solution of the hydrochlorate of the alkaloid, associated with small amounts of a glucoside that is unimportant.†

Properties,—Colorless, odorless, tasteless, slightly soluble in water, but freely in dilute acids. Ammonia water in small amount precipitates it from aqueous solution and an excess of ammonia redissolves it. All the alkaloidal reagents afford precipitates with solutions of its salts, and the following reactions were recorded alike by Prof. Coblentz and ourselves:

Potassio-mercuric iodide—White precipitate from acid solution.
Phospho-molybdic acid—White cloudy precipitate from weak acid solution.
Potassio-cadmic iodide—Pale yellow precipitate from acid solution.
Picric Acid (Alcoholic solution)—Amorphous, yellow precipitate.
Tannic Acid—Pale yellow precipitate from acid solution.
Iodine in solution of potassium iodide—Reddish-brown precipitate.
Platinic chloride—Light yellow precipitate
Auric chloride—Light yellow precipitate.
Mercuric chloride—Slight, white precipitate.

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* We must not forget, though, that some of these resinous bodies occasionally assume crystalline conditions, and perhaps this may possibly crystallize, if the bark is procured at some certain season of the year.

Sometimes an impurity will produce beautiful crops of crystals. From a volatile oil of sassafras, that stood a temperature of 22° F. below zero the writer obtained large crystals of sassafras camphor by adding a speck of ordinary camphor. They remained permanent at 32° F. above zero. These crystals when melted, after some weeks, refused to crystallize until the same operation was repeated, but then again for a time, crystallized easily at 32° F. above zero.

† This glucoside can be separated by means of benzol. We could not crystallize it.

The following color tests are by Prof. Coblentz:

Pure concentrated sulphuric acid—Yellow, changing to red.
Fröhde's Reagent (soda-molybdate and sulphuric acid)—Bright green.
Potassium bichromate and sulphuric acid—Green, then brown.
Nitric acid and stannous chloride—Canary yellow.
Sulphuric acid and nitric acid—Bright red.

Prof. Coblentz adds, "The solution furnished me was colorless and of acid reaction. Upon shaking repeatedly with benzol it was found that the associated glucoside was entirely removed. The solution of the pure alkaloid was then rendered slightly alkaline with ammonia water, shaken with absolute ether, and upon evaporation of ether it remained as an amorphous white residue which gave negative results with reagents for the glucosides.

"This alkaloid was then dissolved in various solvents, and the residues after evaporation were examined microscopically; no crystals could be obtained. The alkaloid was made into salts by means of various dilute acids, and again all attempts to obtain crystals were failures."

In estimating the amount of alkaloid, we found that but eight grains were obtained from 70,000 grains of fresh root bark. It must not be accepted that this represents the entire amount in the bark, as some of the alkaloid was lost in the purification. Probably two-thirds of it escaped in this manner, and, as is usual with alkaloid makers, if these washings had been added to a succeeding batch of like amount, the product would probably have been between twenty and thirty grains.

The small amount of the alkaloid would indicate that it is unimportant, but the physiological report of Prof. Bartholow shows it to possess decided properties, and it is probable that the tonic value of the bark depends mainly upon it. The reactions that we have recorded of it are, possibly, sufficient to merit for it an individuality, and thus to increase the list of alkaloids. Although a sufficient amount was not obtained for a combustion, we believe that no described alkaloid of the related plants will agree with it, and we have therefore ventured, as advised by Prof. Bartholow, to introduce the name *Tulipiferine*.[*] Perhaps future investigations will show that it is identical with some other alkaloid already named.

Coloring Matter of Liriodendron.—After separation of both the resin and the alkaloid, in addition to glucose and the ordinary constituents of plants, there remains in the residual liquid a peculiar coloring matter of some interest. It may be obtained and described as follows:[†]

Exhaust fresh bark of root of Liriodendron Tulipifera with alcohol, add some water and distil the alcohol. After some days filter the liquid and evaporate it to a semi-solid consistence, then incorporate this thoroughly with alcohol in considerable amount. Filter the alcohol from the extractive precipitate and add an excess of ammonia water to the filtrate. The brownish-yellow precipitate is then to be washed with alcohol and dried by spreading it upon glass and exposing it to the atmosphere. It forms brilliant deep brownish-red transparent scales that separate easily from the glass and appear very much like dark-colored scales of citrate of iron.

This substance dissolves slowly in water, producing a yellow liquid that is changed to a dark reddish-yellow by addition of an alkali. It dissolves readily in alkaline water. It is insoluble in alkaline alcohol or in benzol, chloroform or ether. Its color in alkaline aqueous solution is very much lightened by addition of excess of an acid.

It combines neither with acid nor alkali, and fails to neutralize either of them, and its precipitation from alcohol by addition of ammonia seems to be simply due to the fact that it is insoluble in such a menstruum. It is tasteless and is odorless; being of interest only from the fact that it is a characteristic coloring matter of this magnificent American tree.

Oils of Liriodendron.—When the alcoholic percolate of the fresh bark, either the root or tree, is distilled, the volatile oils pass and condense with it. This is in small amount, enough to impart an aromatic odor, and produce a turbidness when water is added, but not enough to separate.

If the fresh bark is distilled with water, the distillate contains an oil that collects upon its surface in very thin layer. Perhaps large quantities of the bark would produce enough for analysis, but lots of twenty-five pounds do not yield enough to even describe satisfactorily. This oil has at first a fragrant odor, reminding of a mixture of orange, lemon and bergamot, but upon exposure it assumes a pure turpentine-like odor. Endeavors to disintegrate the crude oil into others resulted in failures. Whether this oil is a mixture, part of which evaporates easily, leaving the other or others, or whether it undergoes decomposition upon exposure, or whether polymers are formed, is yet to be decided. When we consider how difficult it is to arrive at conclusions regarding ethereal oils that are produced in quantities, owing to their disposition to decompose or form polymers, we think that we can safely accept that the quantitative separation of this rare oil of liriodendron into its constituents, if it be a mixture, and its chemistry, will be a problem of the far future.

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[*] The name Liriodendrine would be more appropriate, but Prof Emmet has already applied the name Liriodendria to a resin. In this connection we call attention to the remarks of Prof. Bartholow, on next page.

[†] J. U. Lloyd in American Druggist, Wm. Wood & Co., June, 1886, p. 202.

A STUDY OF THE ACTIONS OF HYDROCHLORATE OF TULIPIFERINE.—(Written for this publication by Prof. Roberts Bartholow, M. D., LL. D., Professor of Materia Medica, General Therapeutics and Hygiene, in the Jefferson Medical College of Philadelphia.)—I am indebted to Prof. J. U. Lloyd for a solution of Hydrochlorate of Tulipiferine, an alkaloid recently separated by him from *Liriodendron Tulipifera*, and to which I have ventured to assign the name above given. A principle called *Liriodendrin* was obtained by Emmet so long ago as 1831, but it is no longer doubtful that this is not the active principle of the tree. At all events, no investigations of the physiological properties of any constituent of the tree has been undertaken up to the present. Indeed, from the current opinions regarding its therapeutical powers, it is evident that it has not been supposed to possess any considerable activity. Although large doses, relatively, of this alkaloid are required to produce decided physiological effects, it is far from being an inactive substance. An eighth of a grain of Prof. Lloyd's alkaloid affects large frogs, and one grain is sufficient to develop full physiological actions in medium rabbits. The exact lethal dose has not yet been determined, but it is but little above the quantities just named.

General Effects.—In the dose of one-eighth grain it causes paresis, muscular trembling, convulsions of a partly clonic, partly tonic character, heightened cutaneous and ocular reflexes, followed by stupor, increasing paralysis, and finally complete suspension of motility and sensibility. When all the phenomena of life have then apparently ceased, if the chest of the frog is opened, the heart is found to be in slow but rhythmical and sustained action.

In the dose of one-quarter grain administered subcutaneously, the action follows promptly—in twenty minutes—and then the convulsions have a more decidedly tonic character, followed by temporary trembling. The cutaneous reflex is then so much heightened that the faintest impression on the skin is immediately followed by a tonic convulsion, temporary rigidity, and then relaxation succeeds, the limbs remaining extended. After an hour or two the convulsions cease, there is complete muscular relaxation, and the frog seems lifeless; but on opening the chest, the heart is found acting in slow but strong rhythmical contractions, as above stated.

Action on the Peripheral Nerves.—When the sciatic is isolated, it is found that after the action of the medicament begins, the nerve responds to mechanical, chemical and electrical stimuli. As the effect continues and deepens, however, the nerve becomes less and less excitable; but the power of response seems never to be entirely lost. The excitability of the sensory nerves declines *pari passu* with the diminution of the motor, and is at last finally extinguished—for no amount of irritation at last causes any direct or reflex action. Whilst the motorial power is lessening, the muscles continue to respond to the various stimuli to the latest manifestation of any vital action. It follows from these facts that the paralyzing power of Tulipiferine is centric chiefly.

As respects the convulsions, they are found to be centric or spinal in origin, also. If a frog be pithed (*i. e.*, spinal cord destroyed), no convulsions can be produced by any dose.

Action on the Pneumogastric Nerve and Heart.—After division of the medulla oblongata, the heart is exposed *in situ*, and when the disturbance caused by this procedure has ended, the cardiac pulsations are counted, and the rhythm compared with the metronome beating seconds. As the effect of the medicament deepens after the convulsions have ceased, the pneumogastric becomes less and less excitable on faradic stimulation, until at length no action is had from even a powerful current. The muscular tissue of the heart remains excitable up to its physiological death, for after the final cessation of its movements, it can be excited to contraction by a faradic current, and for a time by merely mechanical stimulation. In these effects of tulipiferine, there is some resemblance to the actions of atropine, but more differences. When the effects of tulipiferine begin, the action of the heart is increased in the number of its pulsations, in correspondence with the decline in the excitability of the vagus, but when the vagus ceases to be excitable, the cardiac pulsations diminish in number, but gain in force, the rhythm being preserved. This apparent paradox seems to be explained by the action of the alkaloid on the accelerator apparatus. A coincident loss of the stimulus derived from the accelerator nerves, and of the inhibitory action of the vagus, is, no doubt, the cause of this apparent anomaly.

Tulipiferine has some action on the cerebrum. In warm-blooded animals, a soporose state, deepening into coma, succeeds to the convulsant action. If a barely lethal quantity is administered to a frog, the animal will lie extended, apparently lifeless for twenty-four hours, and probably longer. If, whilst in this state of muscular relaxation and stupor, an irritant be applied, attempts at motion will be made; but when the irritant is withdrawn, the condition of stupor is resumed. Before death, however, complete sensory paralysis takes place, when no response to irritation is made, and that life still exists can be ascertained only by opening the chest to find the heart in action. The sustained and rhymthical action of the heart is even then manifest; the contractions, although occurring infrequently, are still forcible. It should have been mentioned above that the auricles are the last to suspend action.

This study of tulipiferine serves to explain the former empirical uses of Liriodendron. In Rush's time it had reputed virtues as a tonic, as a supporting medicine in fevers, and antiperiodic properties were ascribed to it. The alkaloid will, no doubt, be found useful whenever a tonic to the heart is required. If my conclusions are justified by further studies, and by the observations of others, its applicability to certain phases of cardiac weakness will be peculiarly apt. It is not a powerful alkaloid, and can hardly be dangerous to use, because of the retention by the cardiac muscle of its irritability when a lethal dose has been administered.

THE HOMŒOPATHIC USES OF LIRIODENDRON.—(Written for this publication by Edwin M. Hale, M. D., Emeritus Professor of Materia Medica and Therapeutics in the Chicago Homœopathic College.)—During my early practice in the country, I observed that the people used a decoction of the bark of this tree, or a tincture of it macerated in whiskey, as a domestic remedy in some intestinal disorders, such as diarrhœa, colic and worms.

After testing on myself in health the alcoholic tincture, and finding that it seemed to be a stimulant to the gastric and intestinal mucous surfaces, also as a nerve stimulant, I began its use in certain chronic intestinal catarrhs, accompanied by indigestion, flatulence and pain. In many cases it appeared to act better than Leptandra. It appeared to act best in nervous women and children. The intestinal irritation, under its use, soon disappeared, and the semi. fluid, undigested stools disappeared. It stimulated the appetite, and aided in the assimilation of food. In that class of infantile disorders, usually attributed to worms, particularly when attended by remittent, irritative fever, it seemed to act well, although no worms were expelled.

In doses of one drachm it often appeared to stimulate the gastric functions too much, but when given in doses of five to ten drops, no unpleasant effects followed. For children, my usual plan was to put five or ten drops in one-half glass of sweetened water, and order a teaspoonful of this, to be given every two or three-hours.

During the last ten years I have not used it, but I believe that it will be found a useful remedy when its physiological action is accurately investigated.

PHARMACEUTICAL AND MEDICAL REFERENCES TO LIRIODENDRON TULIPIFERA.

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1857.—Materia Medica and Therapeutics, Mitchell, p. 565.
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1860.—Journal of Materia Medica, Bates & Tilden, p. 161.
1870.—Eclectic Medical Journal, Cincinnati, p. 205.
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MAGNOLIA.

MAGNOLIA BARK.

Parts Used.—The bark of Magnolia glauca, *Linn.* Magnolia acuminata, *Linn.* Magnolia Umbrella, *Lamarck*, and other species.

Natural Order Magnoliaceæ, Tribe Magnolieæ.

Generic History and Description.—The genus Magnolia was established by Charles Plumier[*] in 1703, on a specimen collected by him in the West Indies.[†] He named the genus after Pierre Magnol,[‡] who was at that time next to Tournefort, the most illustrious botanist in France.

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[*] Charles Plumier was a devout monk, belonging to an order known as Minims, and a large part of his life was spent in a cell at the convent of that order in Paris. He acquired a love for botany while studying at Rome, from lectures given by Father Sergeant. On return to France he obtained permission to botanize in the Alps and elsewhere, and while at Marseilles he met Begon, (in whose honor the genus Begonia was named), of the French navy, who procured for him government support. Plumier was sent to the West Indies three times at the expense of the King of France, and published, with government aid, two works—"Description des Plantes de l'Amerique," in 1693, and "Nova Plantarum Americanarum Genera," in 1703. Plumier was a close friend of the great Tournefort, and contributed many plants to his collection. He died in 1704, aged 58 years.

[†] Plumier's description of the genus can be found on page 38 of his "Nova Plantarum Americanarum Genera," and his illustrations on plate seven of the same work. The drawing is of necessity rude and inaccurate, and would hardly be recognized now as a picture of the plant. Plumier called the species "Magnolia amplissimo, flore albo, fructu cæruleo," and it is now known to botanists as Talauma Plumieri, (*Swartz*).

It is of special interest to note that the plant from which the genus Magnolia was established, is no longer included in the genus. The distinction was not, however, known until the name had become so firmly fixed to the American genus of tree, that it was thought preferable to retain the name for them and invent a new name, Talauma, for the West Indian species. Talauma is a tropical genus, with the habits and flowers of Magnolia but with indehescent fruit.

[‡] Pierre Magnol was a physician, who practiced medicine in Montpelier in France; he was born in 1630, and died

The genus Magnolia is a magnificent family of forest trees, differing from most of our trees in having large, showy and fragrant flowers. On this account the Magnolias are well known in localities where they grow, even to persons who pay little attention to objects of nature, for the Magnolia is so conspicuous that it forces itself to the attention of the most unobserving.

For the most part the genus is American, excepting a few species in Japan and Eastern Asia, and it is confined to a comparatively limited territory in this country. Our map (Plate xxxi.) shows the distribution at a glance. In the South it reaches its greatest development, and its natural home is the spurs of the Alleghenies in the Southern States.

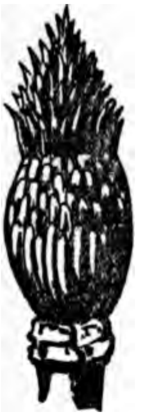

FIG. 112
The stamens and pistils of Magnolia macrophylla, showing the imbricated stamens.

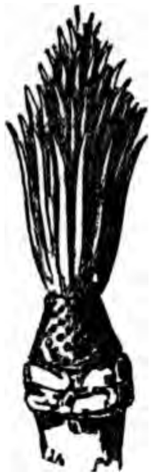

FIG. 113.
The pistils of Magnolia macrophylla, the stamens being removed.

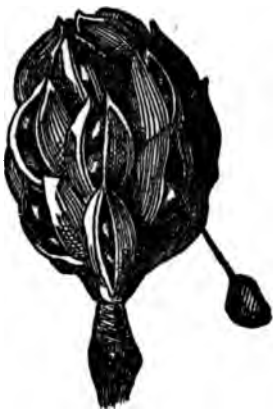

FIG. 114.
Fruit of Magnolia glauca (natural size).

Magnolias are all trees; while one of the species in the swamps of the Northern States is a low shrub, in similar localities of the South it attains the size of a large tree. The flowers (see the Plates) of Magnolia are without exception large and showy. They are solitary, and borne at the end of the branches. The sepals are three, usually spreading or reflexed, and early falling away. The petals are from six to twelve, generally nine, and are arranged in series of three. They are concave, forming a cup-shaped flower. The stamens are numerous and imbricated in spiral rows on the conical receptacle. The anthers are long, yellow, and attached to the inner side* of the filament and open by a longitudinal slit. The pistils are numerous and imbricated on the upper part of the receptacle. The fruit of all Magnolias is a fleshy cone, red or rose-colored, consisting of numerous coalescent carpels,

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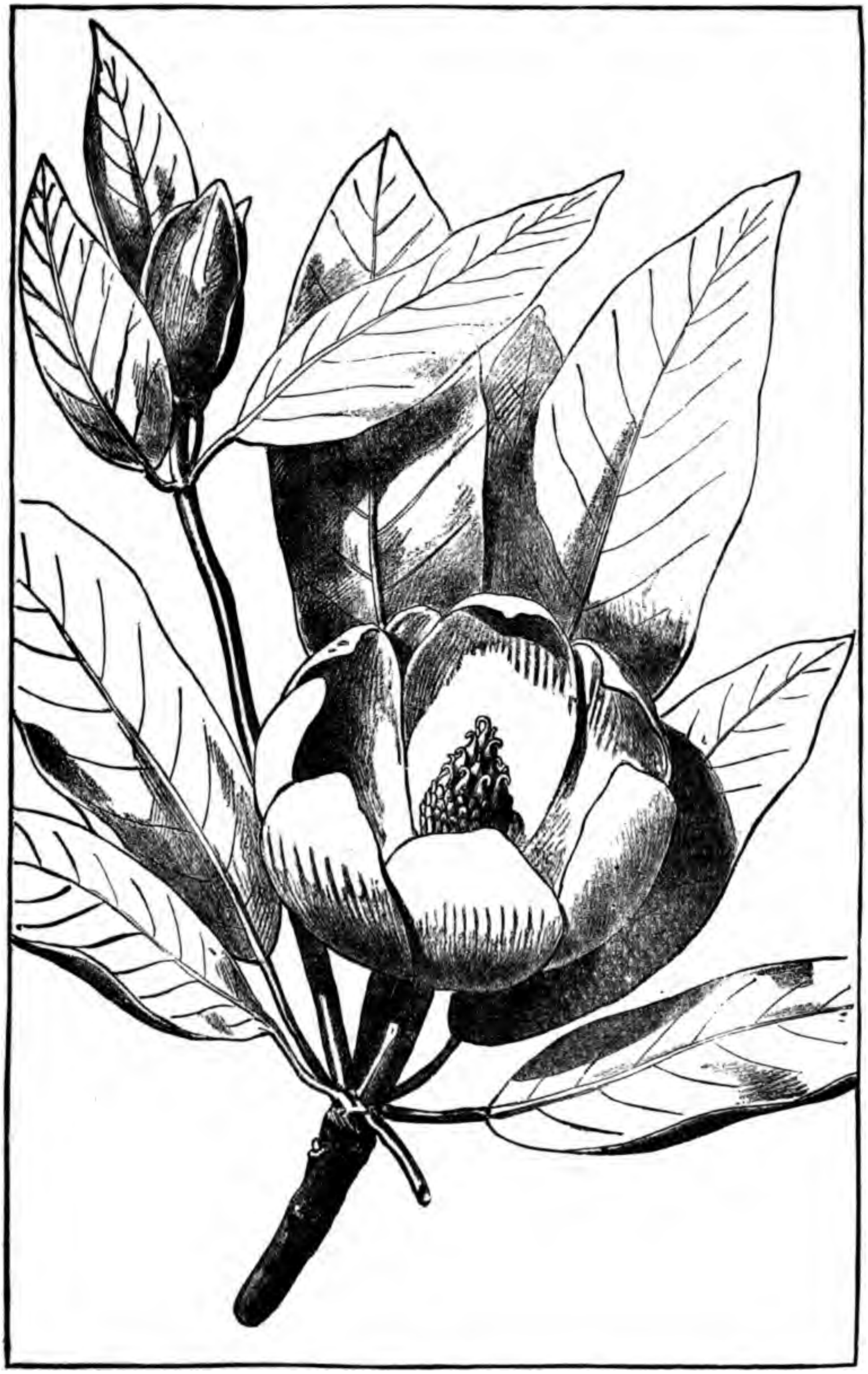
in 1715. In connection with his medical studies he pursued the study of plants with such ardor that he soon established a widespread reputation for his knowledge of botany, and numerous students went to Montpelier to be under his instruction. As the tutor and life-long friend of the illustrious Tournefort, Magnol is perhaps more renowned than from his own works. He published a work on the local plants of Montpelier in 1676, and in 1697 on the plants of the Royal Botanical Garden of Montpelier; both of which works were, however, of the nature of catalogues. He left a manuscript which was published after his death by his son. It is called "Novus Character Plantarum," and on this work Magnol's fame as a systematist chiefly rests.

*This is one of the constant generic characters that distinguishes this genus from Liriodendron; in the latter genus the anthers are attached to the outer side of the filament and open outward.

PLATE XXVIII.



MAGNOLIA GLAUCA.
(NATURAL SIZE.)

firmly attached to the central receptacle, and, when mature, opening down the back. Each carpel contains normally two bright scarlet seed (usually by abortion only one or none). Each seed is attached to base of carpel by a slender thread, by which, when it escapes from the carpel, it hangs suspended, instead of falling at once to the ground.

There are seven native species of Magnolia, which can be readily classed into three sections, as follows :

FLOWERS WHITE, FRAGRANT.	FLOWERS GREENISH-YELLOW, COVERED WITH A GLAUCOUS, WAXY BLOOM,* SLIGHTLY FRAGRANT. LEAVES DECIDUOUS.	FLOWERS WHITE, TINGED WITH PURPLE, FRAGRANT.
Leaves, thick, evergreen. Magnolia grandiflora, Linn. Magnolia glauca, Linn.	*Leaves acute at base.* Magnolia acuminata, Linn. *Leaves cordate at the base.* Magnolia cordata, Michaux.	*Leaves acute at base.* Magnolia Umbrella, Lam. *Leaves auricled at base.* Magnolia macrophylla, Michaux, and Magnolia Fraseri, Walt.

From the preceding description and figures there can be no trouble in determining what are Magnolia trees, and it only remains to distinguish the different species. This can be done by the leaves alone, as follows:

LEAVES EVERGREEN, VERY THICK.	LEAVES DECIDUOUS, ACUTE AT THE BASE.	LEAVES DECIDUOUS, CORDATE OR AURICULATE AT THE BASE.
Rusty pubescent beneath. Magnolia grandiflora. *Pale and glaucous beneath.* Magnolia glauca. (In the northern localities the latter species is deciduous.)	*Leaves clustered at the end of the branches.* Magnolia Umbrella. *Leaves scattered on the branches.* Magnolia acuminata.	*Cordate.* Magnolia cordata. *Auriculate, medium size, six to ten inches.* Magnolia Fraseri. *Auriculate, very large, one to two feet long.* Magnolia macrophylla.

MAGNOLIA GLAUCA.—This is a common shrub in swampy situations near the coast, from New Jersey southward. It extends over a wider range than any other native species, and is found as far north as Cape Ann in Massachusetts, as far south as Florida, and westward into Texas and Arkansas (see map plate xxxi.) Its natural habitat is swampy grounds covered with undergrowth, and especially in pine barren streams and swamps of the Southern States, where it is the most common tree found in these localities.,

In the swamps of New Jersey it is also abundant, and when in blossom it is largely gathered and sold in the markets of Philadelphia and New York.

Ordinarily the plant is a shrub, a few feet in northern localities, twelve or fifteen feet in more favorable situations, but in the Southern States, especially in the rich hummocks of Florida and along streams in pine barrens, it becomes a medium tree, often eighty feet high. The leaves are from four to six inches long, oval, entire, and with a blunt point. They are dark green above and glaucous white beneath, which contrasts strongly with the upper surface. In the Northern States they are regularly deciduous, but become evergreen in the South.

In the bud the leaves are enclosed in the stipules, which fall as the leaves expand, leaving circular scars around the branch. All portions of the young branches, leaves and leaf stalks are covered with a soft, silky pubescence which disappears with age.

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* These two species which have flowers greenish-yellow and glaucous, were considered by Spach sufficiently distinct from other Magnolias, to constitute a genus which he called Tulipastrum.

The flowers (See Plate xxviii.) appear from May to June, according to climate, and remain sometimes into August. They are very showy, pure white or cream-colored, and very fragrant. As before stated, they are often gathered in great quantities and sold in the cities of New York, Boston and Philadelphia. The fruit is a nearly globular cone about two inches long, and reddish-brown when mature, containing bright scarlet seeds.

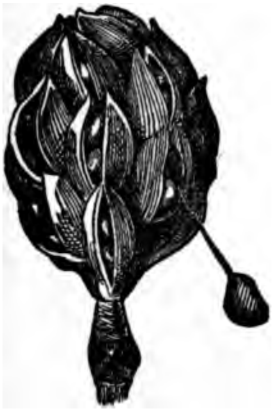

FIG. 115.
Fruit of Magnolia glauca.

COMMON NAMES.—There are a variety of common names applied to the plant. Generally it is designated as a Laurel or Bay from the evergreen leaves. The names by which it is usually known are Sweet Bay and Swamp Laurel, but it is called, also, White Bay, White Laurel, Red Laurel, Holly Bay, Swamp Bay, etc. Small Magnolia, Swamp Magnolia, Sweet Magnolia are names often applied to the tree.

From a fancied resemblance of its aromatic bark to sassafras it has been called Swamp Sassafras.

It is said that the wood is a favorite with the beavers, which use it to construct their dams whenever possible, and tnat it is a favorite food with them. On this account it is called Beaver Wood and Castor Wood. The Indians used the bark as a domestic remedy, and hence it is sometimes called Indian Bark,[*] a term, however, that is applied to a large number of other barks. Mr. A. B. Clute informs us that in the swamps of New Jersey the shrub is called "Brewster" by the inhabitants.

BOTANIC HISTORY.—This was the first species of true Magnolia known to European botanists, and it was transplanted and grown in England for many years before any other species was discovered. It is said that Banister sent it to Bishop Compton, who cultivated it in 1688.[†] It was, however, noticed and mentioned by travelers previous to that date. As early as 1584 we have a record of the plant,[‡] and it was mentioned by many pre-Linnæan writers.

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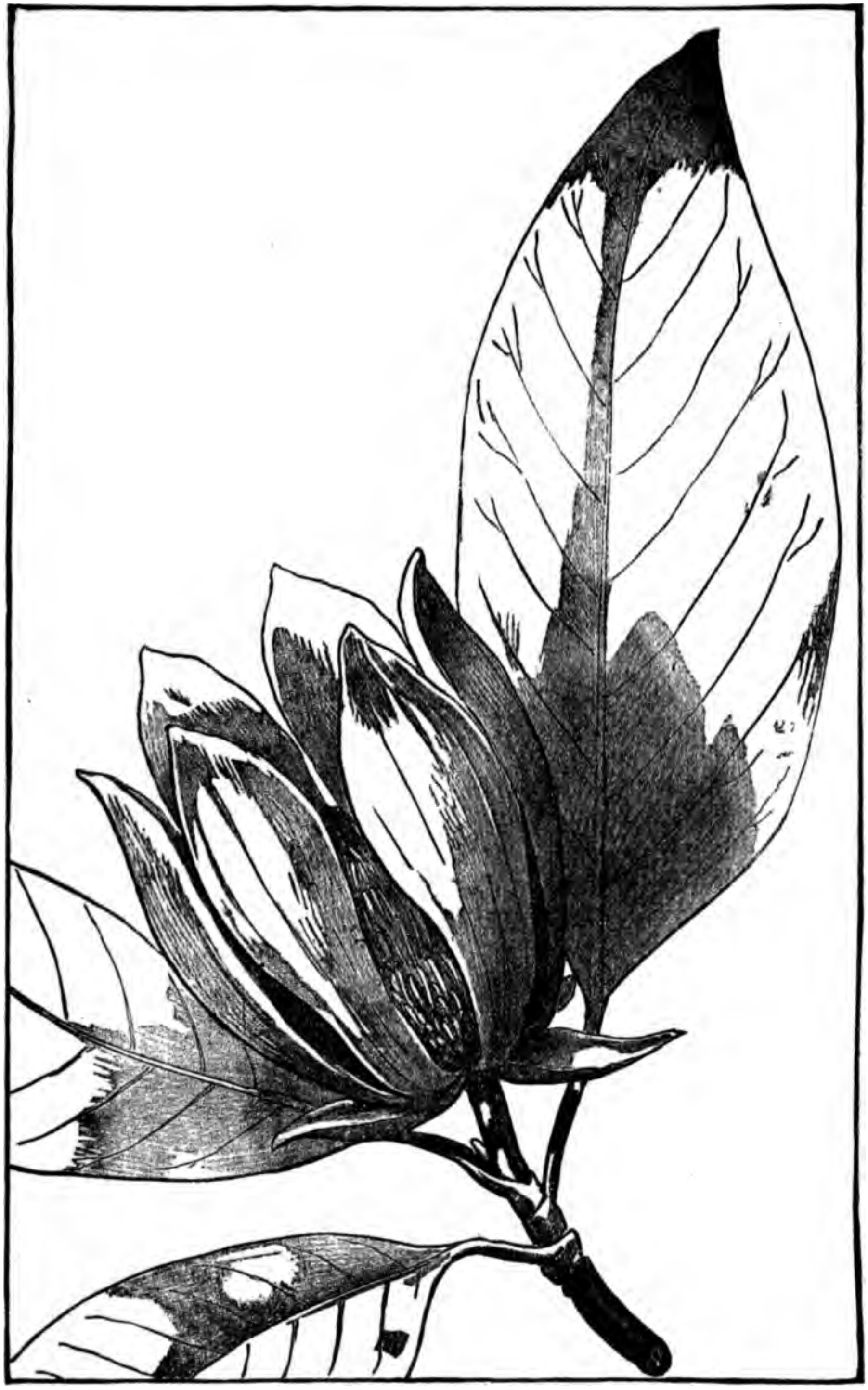
[*] According to Barton, the native Delaware Indian name for the shrub is *Gack-hack-gik*.

[†] Rev. John Banister was a missionary, who was sent by Bishop Compton to Virginia in 1663. He was much interested in both plants and insects, and contemplated writing a natural history of Virginia. He sent many rare plants and drawings to his patron, Bishop Compton. Banister never returned to England, but was killed by falling from some high rocks on one of his trips in quest of plants.

Bishop Compton was an eminent Bishop, born in 1632 and died in 1713. He was Bishop of London from 1675 until his death in 1713. He lived a retired life at Fulham, a suburb of London, where the Bishop of London has a palace, and grounds covering about forty acres of land. Compton took great interest in introducing foreign trees and shrubs, which he carefully cultivated in the grounds attached to the palace, and he was the very first in England to engage in the pursuit. His garden was noted among all the botanists of the day for the foreign novelties it contained. At Compton's death the garden came into the possession of his successor, who, not being interested in the subject, allowed most of the collection to be removed for the purpose of planting more common but more showy trees. Compton's name is commemorated by the American genus Comptonia.

[‡] In Churchill's "History of Voyages and Travels," published in London in 1732, it is stated that in 1584 Arthur Barlow proceeded up Pamlico Sound to Roanoke Island, meeting "among other objects of natural history, the tree that beareth the rind of black synamon, of which like Captain Winter brought from the Streights of Magellan." This evidently applied to Magnolia glauca.—*Pickering*.

PLATE XXIX.



MAGNOLIA ACUMINATA.
(NATURAL SIZE.)

When Linnæus published his first edition of Species Plantarum (1753), the genus Magnolia had been well defined and contained four well known species, all of which Linnæus considered varieties of one which he called Magnolia Virginiana, and this plant he named var. glauca. In the next edition, however, he established them all as separate species, calling our plant Magnolia glauca.* Under this name it is known in all works, excepting by Salisbury (who seems to have had a penchant for changing specific names), who called it Magnolia fragrans. The leaves are liable to vary in different localities, hence several varieties have been specified (latifolia, longifolia, argentea, etc.,) and in early times the deciduous and evergreen forms were supposed by some botanists to be different species, the latter called Magnolia longifolia by Sweet.

MAGNOLIA ACUMINATA.—This species extends over more territory than any other, and further inland, but it is usually not of common occurrence. It grows from fifty to ninety feet high, and is most abundant in the moist valleys in the northern Allegheny mountains. It is sparingly found in western New York† and Pennsylvania, extending southward almost to Florida and westward to Texas, Arkansas and Iowa.‡ It is sparingly found over Kentucky and Ohio (see map, plate xxxi.)

It is more hardy than any other Magnolia, and excepting Magnolia Umbrella and the shrub Magnolia glauca, it is the only species found native in Northern States. The leaves are six to eight inches long, oval, acute, thin, and green on both sides, but much lighter beneath. They are scattered on the branches (not clustered as the next species).

The flowers (see Plate xxix.) are two or three inches in diameter and have petals more spreading (not cup-shaped) than other species. They appear about May 1st, and at that time the leaves are full grown, but have the light-green color of young leaves. The color of the flower is dull greenish yellow, and the petals are covered with a bluish glaucous bloom both inside and out. They are faintly fragrant. In these characters the flowers differ from those of other species, except Magnolia cordata.

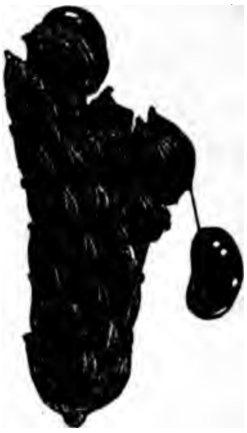


FIG. 117.
Fruit of Magnolia acuminata from Iowa, all but two of the carpels being abortive.

Each petal is about two inches and a half long, concave, leathery, and with three prominent veins on the outside.

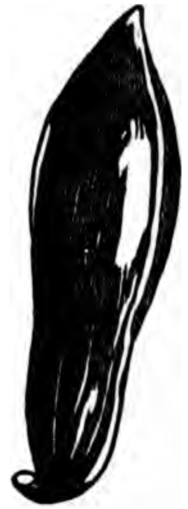


FIG. 116.
A petal of Magnolia acuminata.

The sepals are about an inch long, concave, reflexed, and early caducous. The fruit is more slender than other species, and is from two to three inches long and an inch in diameter.§ It is usually slightly curved, and, when green, somewhat resembles a cucumber; hence the tree is generally known as Cucumber Tree. The same name is applied to other species, but properly belongs to this which was known as Cucumber Tree to the earliest settlers and was so called by Marshall in 1785. In addition to this name the tree is called Blue Magnolia and Mountain Magnolia.

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* The specific name glauca has reference to the glaucous undersurface of the leaves.

† A grove is recorded near Niagara Falls.

‡ We are in receipt of fruit from this tree collected in Iowa.

§ We received a quantity of the fruit of the tree from Iowa which presented some unusual characters. Each cone was about two inches long and one-half inch in diameter, and each had only one or two fertile, seed-bearing carpels, that gave the cone the appearance of having a protuberance on one side, as shown in our figure 117.

History.—This tree was discovered by Clayton[*] early in the eighteenth century, who named it and sent specimens to Gronovius, who published it under Clayton's name[†] in 1739.[‡]

Catesby,[§] who received the tree from Clayton in 1736,[‖] illustrated it in his magnificent work in 1748,[¶] and called it by the name given by Clayton. Bartram[**] about the same time discovered the tree growing on the Susquehanna River and sent it to Collinson[††] in 1736, who was the first to cultivate it in England.

When Linnæus published his Species Plantarum, 1753, this was one of the four species known, and he called it Magnolia virginian var. acuminata. In the next edition (1762) he elevated it to specific rank under the name Magnolia acuminata.[‡‡]

Spach (1839)[§§] established a new genus founded on this species and Magnolia cordifolia, both of which he considered varieties of one species, which he distinguished from the others of the genus Magnolia principally by the glaucous hue of the flowers. He called the genus Tulipastrum,[‖‖] and the species Tulipastrum americanum var. vulgare.[¶¶]

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[*] Clayton came to America from England when he was about twenty years old, in 1705, with his father, who was appointed Attorney General for Virginia; he was placed in the office of the county clerk of Gloster County, Virginia, to which office he afterwards succeeded, holding for fifty years. Clayton was a close student of the plants of the territory then known as Virginia, and he prepared a manuscript description of the plants, and an herbarium, with directions for engraving the plates of his proposed work. These were all destroyed by an incendiary fire by the British during the Revolutionary war, and thus the life-long work of this pioneer botanist was entirely lost.

During his lifetime he sent many plants to John Frederick Gronovious, a physician and botanist of Leyden, who, with the aid of Linnæus, arranged them by the sexual system, and in 1739 published, under the title of "Flora Virginica," a description of such plants as he had received from Clayton. Most of the names of this work and descriptions were probably furnished by Clayton.

[†] Magnolia flore albo, folio majore acuminato, subtus haud albicante.

[‡] Flora Virginica, Vol. I., 1739.

[§] Mark Catesby was an English botanist, born in 1679. He studied in London for a few years, and at the age of twenty-three went on a visit to some relatives in Virginia, where he busied himself for seven years making collections of plants and seed and transmitting them to English correspondents, mostly to Dr. Sherard

He returned to England and was induced by the leading scientists, who raised a subscription for his support, to return to America for the express purpose of delineating the objects of natural history. He resided three years (1822 to 1825) in the Carolinas, making trips inland as far south as Florida. He spent the year 1826 in the Bahama Islands, from whence he returned to England. He acquired the art of etching, and spent about twenty years in producing a most magnificent work entitled, "The Natural History of Carolina, Florida and the Bahama Islands." This work was issued in parts of twenty plates each, the first appearing in 1730; two volumes were printed of one hundred plates each and were finished in 1743. In 1748 an appendix of twenty plates was issued, and this appendix contained the plant we are considering. The plates were highly colored, and this was the most magnificent work that had appeared to that day. Catesby died in 1749 at the age of seventy years. An inferior reprint of Catesby's work, by Edwards, appeared in 1754, and another in 1771. Both are poor in comparison to the original.

[‖] Pickering states, on authority of Sprengle, that the tree was discovered by Catesby on his first trip to Virginia in 1712. That such was not the case, however, is evident from Catesby's notes; he says that he first received the plant from Clayton in 1736, and from the then only known tree.

[¶] The Natural History of Carolina, Florida and the Bahama Islands, by Mark Catesby, second volume, 1843, plate 15 of the Appendix (or plate 115 of the second volume). The picture is a poor representation of the plant; the petals are too broad, flat (not concave), and white (not yellowish green).

[**] See note ‡ on page 293, Volume I.

[††] Peter Collinson was a wealthy merchant of London, who, about 1740, maintained a private residence and garden at Mill Hill, ten miles north of London. He was a liberal patron of Bartram, and obtained many American trees and shrubs from him for his garden. It is to Collinson that the world is indebted for the appearance of Catesby's magnificent work, for he furnished the money that enabled Catesby to engrave and publish it.

[‡‡] So named from the acuminate leaves.

[§§] Histoire Naturelle des Végétaux, Paris, 1839, Vol. VII., p. 483.

[‖‖] Regarding the name Tulipastrum, Dr. Chas. Rice writes as follows: "It is formed quite correctly, on the analogy of other Latin words ending in *-aster*, *-astra* and *astrum*, nearly all of which denote something a little inferior in quality. A familiar modern example is *poetaster*, which has been coined in modern times as a term to denote a 'would-be poet' and which is derived from the classic 'poeta.' In ancient writings we have Apiastrum, a sort of apium; Oleaster, a sort of olea, etc., and modern writers have applied the principle to other names, as Cotoneaster and Tulipastrum. Tulipastrum, therefore, denotes a plant that has some resemblance to, or affinity to Tulipa.

[¶¶] We also find the synonyms Magnolia pennsylvanica and Magnolia rustica applied to this plant, but do not know by whom they were originated.

Magnolia Umbrella.—This tree, being a Northern species, is an officinal source of the bark, although it is doubtful if it has ever yielded any of the drug. The tree grows in the mountains of Pennsylvania, though not abundant, and extends south into Georgia and Alabama, and, as with most others of the species, its most abundant occurrence is in the moist and woody valleys in and near the mountains of the Southern States.

It is usually known as Umbrella Tree, a name applied to it by the earliest settlers, and as early as 1789 given as a specific name by De la Marck and adopted by all recent botanical writers. The large, thin leaves grow close together almost whorled near the extremity of the branches, and spread out over a large surface, giving the appearance of an umbrella, and this is the principal characteristic of the tree. In a few localities, chiefly in the mountains of Virginia, it is known as Elkwood, presumably from the resemblance of points of the shoots to the horns of an elk. In some of the Southern States it is called Cucumber Tree, a name more properly belonging to the previous species.

Magnolia Umbrella is a small tree, seldom more than thirty feet high, with smooth light-gray bark. The leaves are fifteen to twenty inches long and six to eight inches broad, and grow in a cluster near the end of the branches, and as before stated, spread horizontally over a large surface, giving the appearance of an umbrella, hence the name of Umbrella Tree.

The flowers are borne in May or June on the extremities of the last year's shoots. They are white, fragrant, and have an odor described as strong but not pleasant. The fruit is similar to that of Magnolia acuminata, but larger.

Botanical History.—This tree was discovered by Mark Catesby[*] about 1712, on his first trip to what was then known as Virginia. It was illustrated in the second volume of his work[†] published in 1743, and the common name Umbrella Tree applied to it. The tree was introduced into Europe about 1752, by whom it is not known.

When Linnæus published his first edition of Species Plantarum (1753), he called this Magnolia Virginiana var. tripetala, and in the next edition (1762) Magnolia tripetala. This name was applied to it by all the early botanists, but for nearly fifty years has been discarded, and the only recent work which uses it is the Pharmacopœia. The name is manifestly inaccurate and misleading, because the tree, instead of being three petaled, is six to twelve petaled, and the three exterior reflexed organs from which the name is derived are not petals at all, but sepals.

In 1789[‡] De la Marck, a French botanist, very wisely changed the name to Magnolia Umbrella, giving the specific name by which the tree has always been known to the people. He was followed by Torrey & Gray and all recent botanists, and it is the name by which the tree is now recognized by all botanical authority.

Magnolia Grandiflora.—This is a peculiarly southern species, and does not extend farther north than 32° 30′[§] and is eminently a type of the flora of the South. It extends west into Texas, and south into Mexico. It reaches its greatest development on the "Bluff" formations of the Mississippi

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[*] Note § page 30.

[†] Natural History of Carolina, Florida and Bahama Islands, by Mark Catesby, Volume II., (1743) plate 80, described under the name Magnolia amplissimo flore albo, fructu coccineo.

[‡] Encyclopédie Méthodique Botanique, Paris, 1789, Vol. III., p. 673.

This work was a French Dictionary that considered plants alphabetically. The author, after the French revolution, changed his name to Lamarck, hence is often quoted under the abbreviation *Lam.*

[§] —Mohr.

River below Vicksburg.[*] This species is the noblest forest tree of the extreme South. It rises with a perfectly erect columnar trunk, unbranched below, to the height of a hundred feet, and is covered at the summit with a magnificent head of evergreen foliage. The trunks are often from three to four feet in diameter at the base.

The leaves are evergreen and very thick and leathery; they are six to ten inches long and three to four inches broad, and are oblong in shape and have margins very entire. Above, the surface is smooth and glossy, and beneath, with strong contrast, it is covered with a dark rusty brown pubescence.

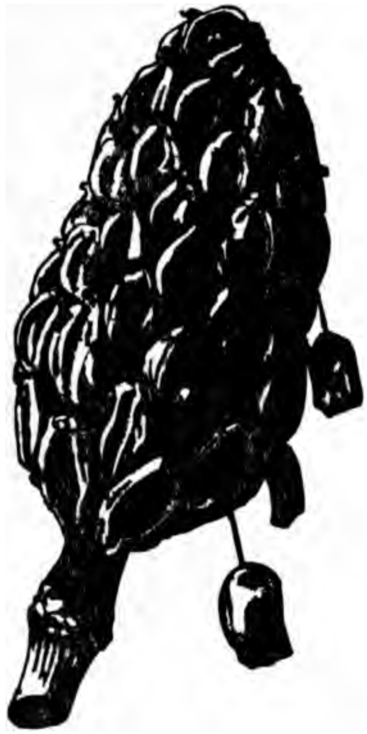

FIG. 118.

Fruit of Magnolia grandiflora (natural size).

The flowers are very large, from six to ten inches in diameter, and expand in early spring; they are pure white and have thick concave petals. They are remarkable for the strong odor they emit, which is very pleasant and agreeable at a distance, but is oppressive when concentrated, as in a close room, and, with some persons, causes headache.[†] The flowers are largely shipped in moss to Northern cities and sold by florists.

The fruit is an oval pubescent cone, well portrayed in our accompanying picture.

There are a number of names applied to the tree. It is simply known in its native habitats as Magnolia, as, if not the only species in most places, it is the only one known to the generality of the people. It is also very commonly known as Big Laurel[‡] and Bull Bay. The following names we also find applied to it in books: Laurel-leaved Magnolia, Large-flowered Magnolia, Evergreen Magnolia, Bay Tree, Laurel Bay.

Botanical History.—This tree was discovered by Catesby on his second trip to America, about 1722, and was illustrated in the second volume of his work in 1743.[§] Linnæus, 1762,[‖] named it Magnolia grandiflora, which name it has always retained without exception.

OTHER SPECIES.—There are three small, rather rare species of Magnolia, distinguished from the preceding, by having leaves cordate or auriculate at the base. They are only found in the woods of the Southern States and near the mountains.

MAGNOLIA MACROPHYLLA.—This is a remarkable tree from the size of the leaves, which are from two to three feet long, and larger than the leaves of any other native tree. They are disposed in a cluster at the summit of the branches, like the Magnolia Umbrella, with which it always grows, hence the tree is known as Large-leaved Umbrella Tree, Large-leaved Magnolia. The flowers are very large and fragrant; the bark is smooth and silvery white, by which it can be distinguished from Magnolia Umbrella (even in winter), and it can also be readily recognized by the lobes at the base of the leaf, as shown in our drawing (plate xxx.)

At the time of flowering the leaves are but partly grown.

Michaux discovered this tree in 1786 and named it in his Flora Boreali Americana.

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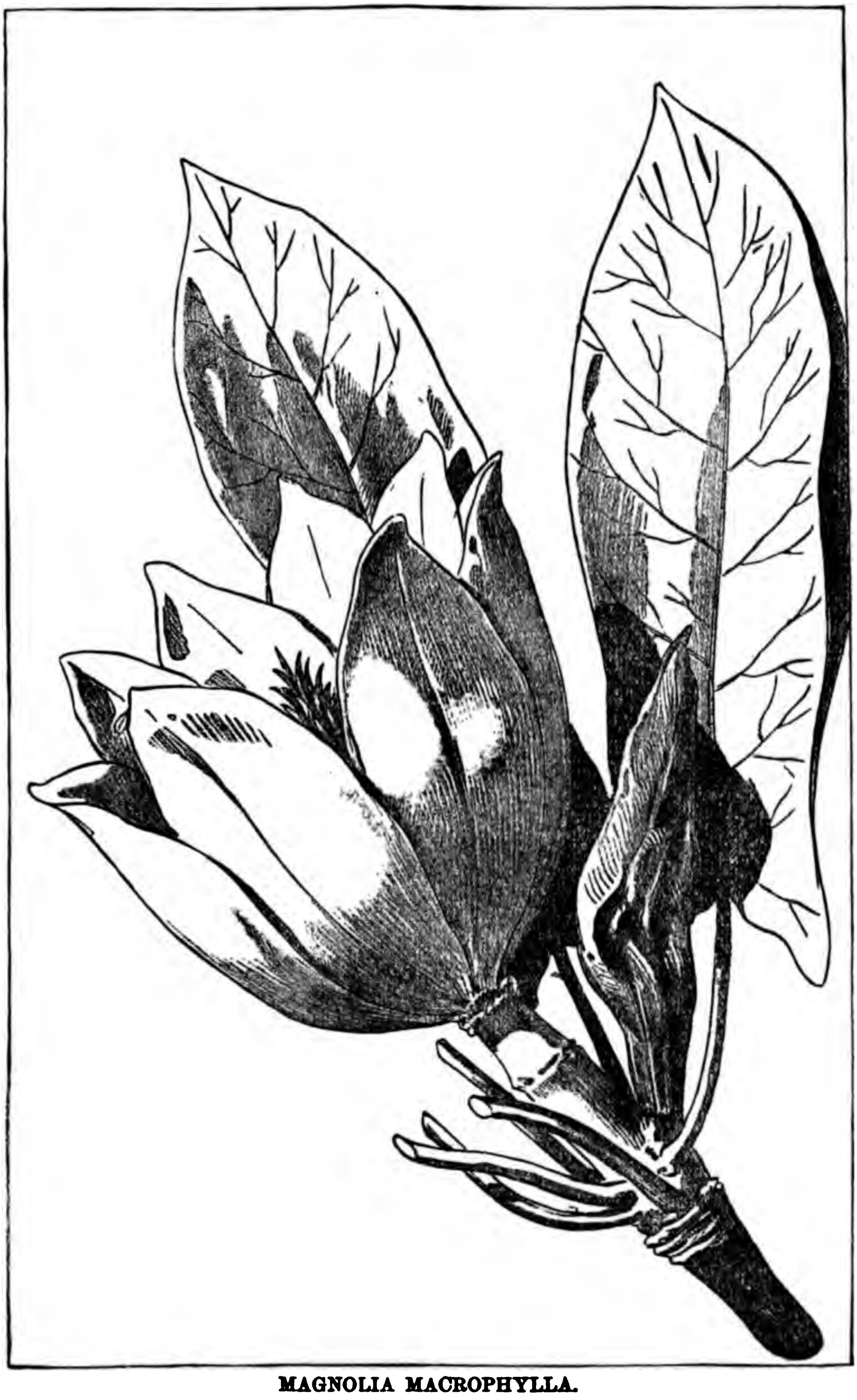
[*] —Sargent.

[†] It is said that the Indians will never sleep under the tree when in bloom, and that they believe the perfume, when inhaled from a group of trees, is overpowering and strong enough to cause death.

[‡] The common Laurel of the South is Rhododendron maximum.

[§] Catesby called it "Magnolia altissima, flore ingenti candido," Natural History of Carolina, vol. ii., plate 61.

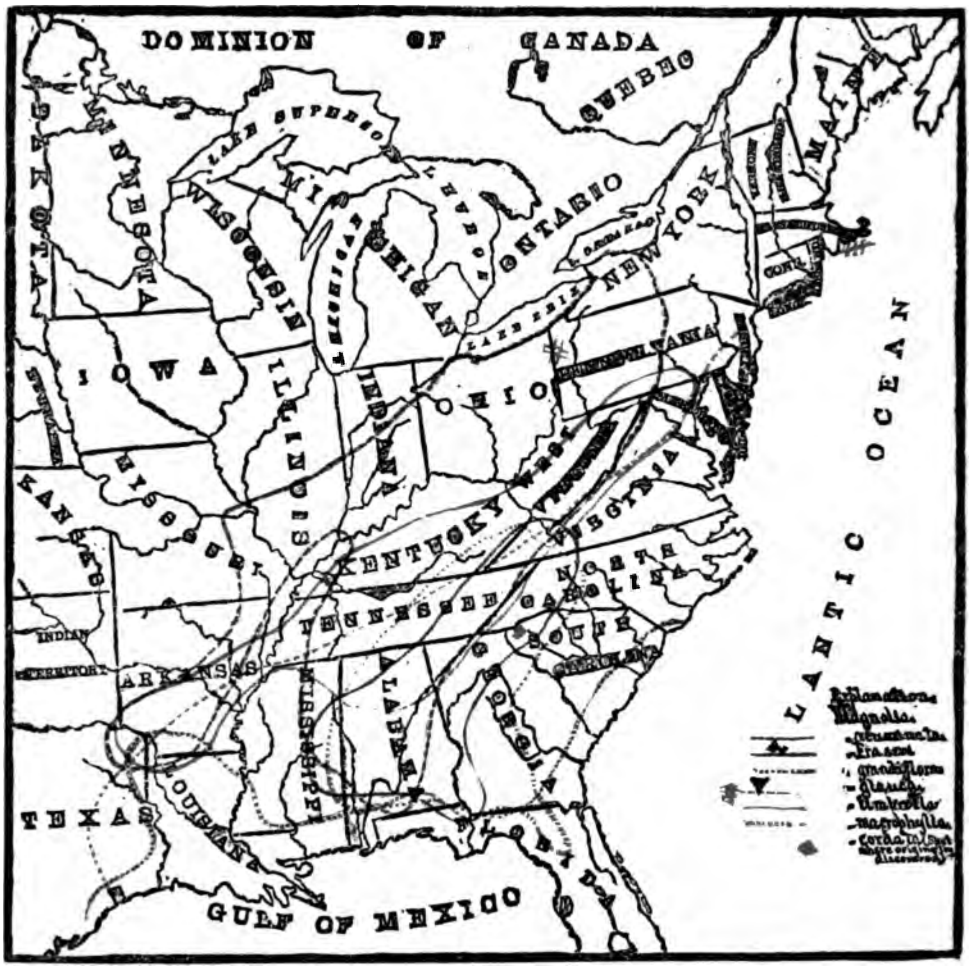
[‖] In the first edition of his Species Plantarum (1753), Linnæus was confused regarding the American species of Magnolia, all of which he called varieties of Magnolia virginiana. This plant he enumerates under two names, Magnolia virginiana var. fœtida and Magnolia virginiana var. grisea.



MAGNOLIA MACROPHYLLA.

(NATURAL SIZE.)

PLATE XXXI.



MAP SHOWING THE DISTRIBUTION OF THE GENUS MAGNOLIA IN THE UNITED STATES.

PREPARED BY PROF. C. S. SARGENT.

EXPLANATION.

Blue-------Boundary line of Magnolia acuminata.
" ——— " " " Fraseri.
" ....Northern " " " grandiflora.
Red .... " " " macrophylla.
" ——— " " " Umbrella.
" ------- " " " glauca.
Red Spot—Place where Magnolia cordata was originally discovered.

Magnolia Cordata.—This is the rarest of all the species. It was discovered by Michaux in the Northwestern corner of South Carolina in 1788, and by him taken to Europe, where it was cultivated; but has probably never since been found in a wild state by any botanist.[*]

It differs from all other species in having yellow flowers, hence, it is called Yellow Cucumber Tree; cordate leaves, hence, known as Heart-leaved Magnolia; and flowers covered with a glaucous bloom agreeing in this latter respect with the Magnolia acuminata alone.

As before stated it formed with Magnolia acuminata, Spach's genus of Tulipastrum. Spach called it Tulipastrum Americanum var subcordata.

Magnolia Fraseri—This tree is also of comparatively little interest, being a native only of a restricted locality in the South. It can be known by the peculiar shape of the leaves, which are somewhat similar to those of Magnolia macrophylla, but much smaller, being only eight to ten inches long. They are obovate, acute at the apex, and taper to the base, and have two short, obtuse, ear-like lobes at the base.

The tree is known as Ear-leaved Magnolia, Auricled-leaved Magnolia, and Long-leaved Magnolia.[†] There are two names, also applied to the plant in the South, which are unfortunate to introduce into a medical work like this, because they properly belong to two other plants largely used in medicine. One is Indian Physic, which properly belongs to Gillenia trifoliata; the other is Wahoo, correctly applied to Euonymus atropurpureus. The name Indian Physic was applied to this tree at a very early date, and in the matter of priority, belongs to it.

In most botanical works, excepting late ones, the tree is known as Magnolia auriculata, a name given to it by De la Marck in 1789.[‡] Walter had previously (1788) named it Magnolia Fraseri, in honor of his friend, a nurseryman of London. Walter's name was overlooked until 1840, when Torrey and Gray restored it on account of priority. A form of the tree was described by Bartram as Magnolia pyramidata as a distinct species, but it is not now thought to be even a variety.

Geographical Distribution of the Genus Magnolia in the United States.—(Written for this publication by Prof. C. S. Sargent.)—The Genus Magnolia in North America, represented by six or seven species, is confined to the Southern and Central Atlantic region with a single species reaching North to Massachusetts Bay, and with a second species reaching westward to the Valley of the lower Brazos River in Texas. The geographical center of distribution of the genus in America occurs in the Allegheny Mountain region of North and South Carolina, where six of the seven species are found.

Magnolia Glauca.—The most widely distributed of the American species is found in a single locality, in the town of Magnolia in Essex County, Massachusetts. It reappears in New Jersey and ranges South, generally, near the coast, to the shores of Tampa Bay and Bay Biscayne, Florida. A single station for this tree is reported on Slippery Rock Creek, in Lawrence County, Pennsylvania, near the borders of Ohio; it is common throughout the basin of the Mississippi River, south of Kentucky, extending west to Southwestern Arkansas, and the valley of the lower Trinity River, Texas. It is most common in the South Atlantic and Eastern Gulf States, attaining its greatest individual developement in Central Florida.

Magnolia Grandiflora,—is common along the Atlantic and Gulf coasts from the valley of the Cape Fear River in North Carolina to that of the Brazos in Texas; in Florida it extends across the peninsula, North of Mosquito Inlet and the shores of Tampa Bay; and through southwestern Arkansas and western Louisiana to the neighborhoods of Vicksburg in Mississippi. It is most common on the coast of the eastern Gulf States, attaining its greatest development on the "Bluff" formations of the Mississippi Valley and western Louisiana.

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[*] Dr. Chas. Mohr discovered in Northern Alabama, a tree, which at first was supposed to be Magnolia cordata of Michaux, and was so classified in Prof. Sargent's Report of the Forests in North America, Tenth Census Report. After long consideration, however, it has been decided that the tree is only a form of Magnolia acuminata, with golden yellow flowers, and broad, less acuminate, and sometimes slightly cordate leaves. The result of Prof. Sargent's investigation this summer (1886) is that the species "will best be considered a variety of Magnolia acuminata." (See his article following.)

[†] This name is hardly appropriate as the leaves are not longer than others of the species.

[‡] The name was first published by De la Marck, but it was probably the name by which Bartram introduced the plant into Europe. Bartram used the name two years later in his "Travels through North and South Carolina," and it is certain he did not obtain it from De la Marck.

Magnolia Acuminata.—This species is found from western New York to southern Illinois; it extends along the Allegheny Mountains to southern Alabama; it is scattered through eastern and middle Kentucky and Tennessee, northeastern Mississippi, and northeastern and southern and southwestern Arkansas. It is most common and attains its greatest individual development in the slopes of the Southern Allegheny mountains from Virginia to Georgia.

Magnolia Cordata,—will best be considered, perhaps, a variety of *Magnolia acuminata* from which it differs in its smaller yellow flowers and broader rarely cordate leaves. Individual trees, intermediate in character between *Magnolia acuminata* and *Magnolia cordata* as known in cultivation, appear in the southern Allegheny regions from western North Carolina to northern Alabama, although the exact prototype of the cultivated tree, introduced into Europe a century ago by the Elder Michaux, and later widely distributed in gardens, has not been rediscovered in a wild state.

Magnolia Macrophylla,—is widely scattered from western North Carolina to southeastern Kentucky, extending south to western Florida, southern Alabama, and the valley of the Pearl River in Louisiana, and in central Arkansas. It is the rarest and most local of the American Magnolias.

Magnolia Umbrella,—is found from southeastern Pennsylvania, southward along the Allegheny Mountains to central Alabama and northeastern Mississippi, extending west through Kentucky and Tennessee to central and southwestern Arkansas.

Magnolia Fraseri—is a local species of the southern Allegheny Mountains from Virginia to western Florida, extending west to southeastern Kentucky, middle Tennessee, and through southern Alabama to Mississippi.

DESCRIPTION OF THE DRUG.—The bark as found by us in market is that of the young limbs. It has an ash-colored surface, and is yellowish or brown beneath. The external part is generally smooth, but blemished by scattering warts and occasional fissures, this being especially true of the older specimens. The external layer of the bark is brittle, the inner layer fibrous and tough.

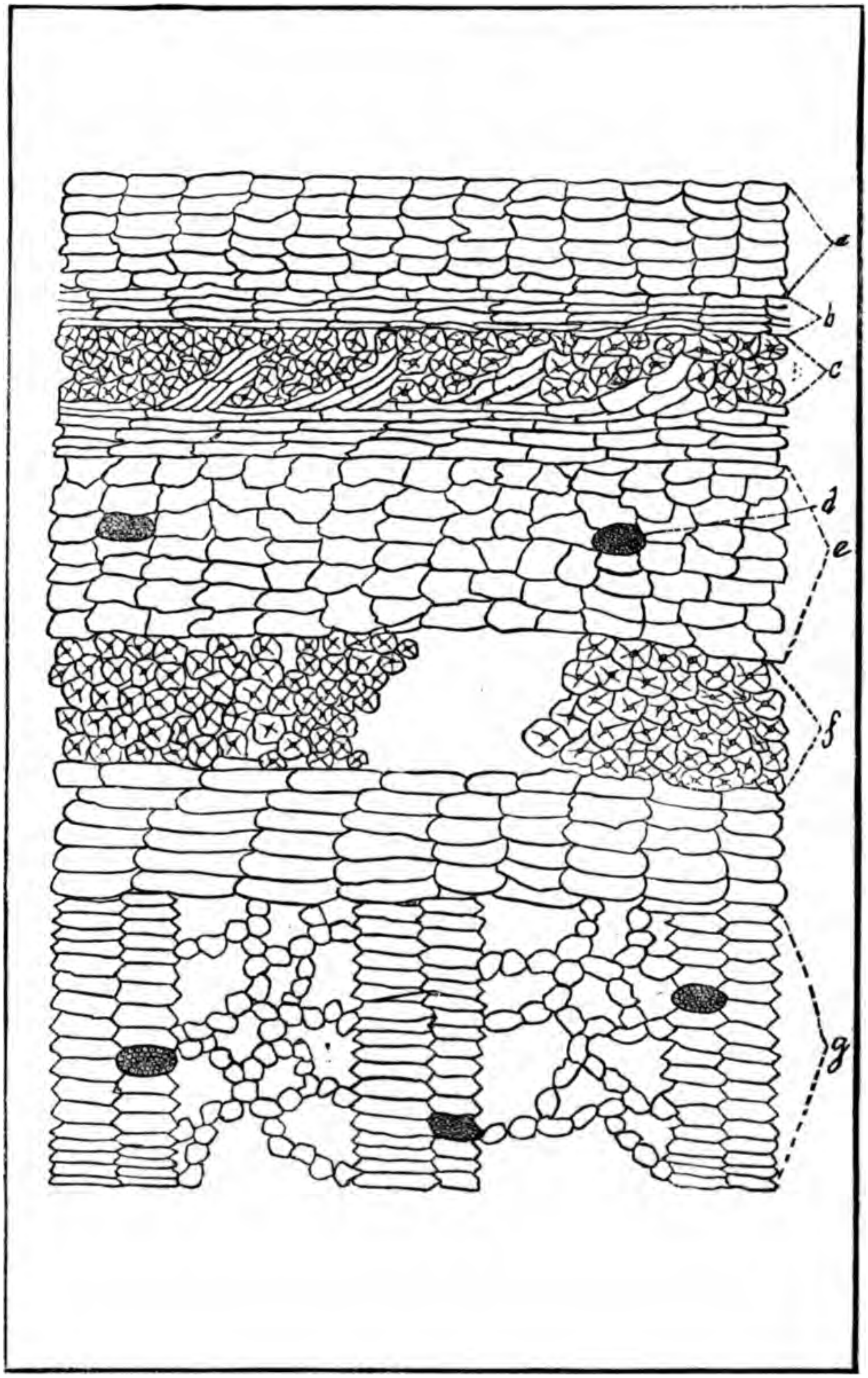
The dried bark is nearly inodorous, has an astringent bitter taste, but is not aromatic. It separates readily from the wood and appears in market as thin curved quills from one-sixteenth to one-eighth of an inch thick.

MICROSCOPICAL STRUCTURE OF THE BARK OF MAGNOLIA GLAUCA.—(Written for this publication by Robert C. Heflebower, M.D.)—On the outside of the bark is the usual layer of cork, consisting of several strata of cork cells. These cells are very regular in form, and resemble very much one another. The layer is from five to eight or nine cells in thickness, increasing or decreasing in thickness very gradually. On the surface of the bark are seen, in some places, warty excrescences, which are covered by an increased number of layers of cork cells. Beneath this layer of cork is a thin layer of parenchymatous tissue, the green portion of the bark. This is from four to seven cells in thickness, and is easily distinguished by the shape and size of the cells.

Next in order is a layer of elongated, spindle-like schlerenchymatous fibres, the strengthening tissue or bast. This layer of tissue is placed between the two parenchymatous layers, and is easily recognized by the thick cell-walls and the length of the cells. This is the third layer of tissue inward, and is located on the outside of the parenchyma, which contains the resin sacs.

The next layer, that of the sarenchyma, is the thickest of all the tissues entering into the bark formation, and is the one that contains the resin sacs found

PLATE XXXII.



TRANSVERSE SECTION OF THE BARK OF MAGNOLIA GLAUCA,
(MAGNIFIED 150 DIAMETERS.)

EXPLANATION.—*a*, corky layer; *b*, parenchymatous layer beneath corky layer; *c*, bast layer; *d*, resin sacs in parenchyma; *e*, parenchymatous layer; *f*, stone-cells; *g*, medullary portion.

in the bark. These resin sacs are short, nearly iso-diametric, and occupy the space of one cell or little more. They lie mostly solitary, but are occasionally found in groups of four, five, or even more.

The next layer to the sarenchymatous, and the one to the inner side of it, is a thin layer of short schlerenchymatous elements, or stone cells, of a nearly iso-diametric form, as is seen by the sections, both longitudinal and transverse.

The cambium is the next layer, and is of only a few cells thickness, it being, for the most part, composed of cells with the shorter diameter from within out.

On the inner side of the cambium layer, and closely connected to it, is the woody structure of the stem. This contains, in the medullary rays, considerable starch; and in the inter-medullary spaces there is more resin, in proportion, than in the parenchyma of the bark. The sacs in which it is contained are similar to those of the parenchyma, and their size is about the same.

See plate xxxii. for a transverse section of the bark.

PHARMACOPŒIAL HISTORY.—The first (1820) pharmacopœia failed to recognize any species of Magnolia. The 1830 revision (Philadelphia) gave place in the secondary list to three species, "Magnolia glauca, Magnolia acuminata and Magnolia tripetala;* the officinal portion being "the bark." The New York edition of same date, (1830,) recognized the bark of Magnolia glauca, referring to it as "Bark of the Small Magnolia, or Sweet Bay." From 1830 to 1880 the three species of the Philadelphia edition remained officinal, occupying the secondary list until 1880, when the distinctions, primary and secondary were discarded.

The pharmacopœia, excepting the New York edition, 1830, has it will be seen recognized three species, Magnolia glauca, Magnolia acuminata and Magnolia Umbrella (under the name tripetala). The reason for selecting these three is obviously because they are the most Northern species. In our opinion it would have been better to have specified the Magnolia glauca alone, as this shrub is the most aromatic, and presumably superior to others in medical action. Had it been the intention to mention the trees that supply the bark of commerce Magnolia glauca, Magnolia acuminata, Magnolia Umbrella, and Magnolia macrophylla should have been named.†

None of the species of Magnolia are in use at present by the medical profession of America, and have not been employed for a generation. This assertion is based upon the reports of correspondents from every section, and from all the large cities of America, in accordance with which we accept that Magnolia should not be retained in the Pharmacopœia.

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*"Tripetala" is the discarded botanical name for the "Umbrella". See page 31.

†The limited quantity of bark used in commerce is all collected in the mountains of North Carolina, and indiscriminately from these species, which are the ones common there.

CONSTITUENTS.—Dr. John Floyd, 1806,[*] found by distillation with water, in the bark of Magnolia Umbrella and Magnolia acuminata, an aromatic oil in very small amount; and by extraction with alcohol, a resin and bitter principles. His chemical examination indicated that the resin was the characteristic constituent.

Coxe, 1825, states in his American Dispensatory, that the fresh bark of Magnolia glauca contains the aforenamed substances, and it is evident that his assertion is upon the authority of Dr. Floyd, although, credit is withheld. These statements were repeated by subsequent writers until 1842.

Dr. Stephen Proctor, 1842,[†] made an analysis of the bark of Magnolia grandiflora, being led to do so by the botanical relationships between the genera Magnolia and Liriodendron. He sought to find the liriodendrin[‡] of Prof. Emmett, and by Emmett's process, employing magnolia bark instead of liriodendron, he obtained "numerous acicular crystals." He did not, however, assert that they were identical with liriodendrin, but that it "appears to be analogous to that of the liriodendrin." He also found a resinous body and a volatile oil.

Dr. W. H. Harrison, 1862,[§] reports as the result of an analysis of the bark of Magnolia glauca, a resin and volatile oil; from the fruit he obtained much fixed oil and small amounts of fragile transparent crystals that appeared upon the filter paper, when the alcoholic solution of the resinous body obtained by Emmet's process for liriodendrin, was filtered. He states that "the crystals crack under the teeth and when freed from resinous matter have little taste or odor." This was his only description of them. It is evident that they were not the liriodendrin of Emmet, but a new body now known as *magnolin.*

Wallace Procter 1872,[‖] found that an alcoholic tincture of the fruit of Magnolia Umbrella, deposited transparent colorless crystals that were insoluble in cold water; slightly soluble in boiling water; very soluble in alcohol, ether, chloroform, carbon bisulphide and benzine; neutral to litmus paper and not basic. These crystals were obtained by other processes, one being to boil the tincture of the fruit with lime or magnesia, cool, filter, and add water to the filtrate. After some days crystals appeared, some half an inch in length. It seemed that the nearer the crystals were obtained in a state of purity, the less taste was apparent. In this connection, we will say that Prof. J. M. Maisch has supplied us with small specimens of these crystals of magnolin, now yellowish by age, but perfectly tasteless and colorless when recrystalised. Mr. Proctor also found a soft pungent resin, fixed oil, volatile oil, a hard resin but no liriodendrin.

It is therefore recorded that the different species of Magnolia contain in addition to the usual constituents of plants, a volatile oil, resinous matters, and a crystalline body, magnolin, that is not identical with liriodendrin, but no alkaloid has ever been isolated.

Examination of Magnolia Glauca.—In consequence of the fact that previous attention had only been given to the other species with quite uniform results, we thought it necessary to examine only the bark of Magnolia glauca, the result being as follows:

The dried bark of the tree of Magnolia glauca was powdered, percolated with alcohol, and the alcohol distilled. The residue was treated with water and filtered. The insoluble matter was a resinous body, black and shiny upon the surface, of an oily odor, a disagreeable taste in substance, and very bitter in solution, tenacious and sticky at ordinary temperatures, but not thin enough to flow. It was entirely soluble in diluted potash water, and refused to deposit crystals from any solvent. Upon examination it proved to contain three resins, with the following properties:

All dissolved in alcohol.
Benzol separated one, (A).
From the residue, ether extracted another, (B).
Leaving the third,[¶] (C).

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[*] An experimental inquiry into the Medical properties of the Magnolia tripetala and Magnolia acuminata, John Floyd, M.D., Philadelphia, 1806. (A. Thesis presented to the University of Pennsylvania and published in pamphlet form).

[†] A. Thesis presented the Jefferson Medical College, Philadelphia, printed in the American Journal of Pharmacy, July, 1842, p. 89.

[‡] See this publication, Vol. II., p. 14, for remarks on liriodendrin.

[§] American Journal Pharmacy, 1862, p. 29.

[‖] American Journal Pharmacy 1872, p. 145.

[¶] Solvents applied as above divide the crude, resinous body in that manner. It is scarcely necessary for us to repeat that the study of associated resins and their by-products is, as yet, accompanied by great obstacles.

Resin A.—This is obtained by extracting by means of carbon disulphide, the crude resin of Magnolia tree bark, filtration and evaporation of the solvent. The residue contains some impurities, and should be again exhausted with carbon disulphide (or benzol,) and after some days the solution filtered and again evaporated, stirring until the menstruum is dissipated.

This produces a resinous body of a green color and a peculiar, disagreeable, heavy odor. It is a thick liquid at ordinary temperatures, flowing slowly at 60° Fah., and at low temperature it becomes tough, but not brittle. To the taste, in substance it is nauseating and slightly bitter, but, in alcoholic solution it is intensely bitter.

The resin dissolves freely in carbon disulphide, benzol, concentrated sulphuric ether, absolute alcohol, chloroform, or any mixture of these liquids. Concentrated aqueous solution of caustic potash seems not to affect it, but dilute solution dissolves it slowly. Concentrated ammonia water disintegrates it, dissolving a portion; dilute ammonia water dissolves it quite readily.

This resin refuses to crystallize from any solvent. It has the specific gravity 1.047.

Resin B.—After separation of resin "A," extract the residue with concentrated sulphuric ether, filter and evaporate the filtrate. This produces a dark brown resin that is brittle at 32° Fah., but becomes waxy when warmed. It melts, forming a sticky tenacious liquid at increased temperature, and chars at high heat, leaving a carbonaceous residue. It is nearly tasteless when chewed, but in alcoholic solution is very bitter. It has but little odor.

Carbon disulphide and benzol do not dissolve it. Concentrated sulphuric ether, absolute alcohol and chloroform or mixtures of these liquids, dissolve it freely with brownish, yellow color. Concentrated ammonia partly dissolves it; dilute ammonia freely. Strong solution of caustic potash scarcely affects it; dilute, dissolves it freely.

This resin refuses to crystallize from any solvent. It has the specific gravity 1.141.

Resin C.—After separation of resin "A" and resin "B", dry the insoluble matter, and extract it with absolute alcohol; filter and evaporate the alcohol. The residue is a brown, brittle resin, easily powdered, at ordinary temperatures, of a bitter taste in alcoholic solution, but less so than either of the others.

It is insoluble in ether, benzol and carbon disulphide;* slightly soluble in chloroform, and very soluble in absolute alcohol, forming a brownish, yellow liquid. Concentrated or dilute ammonia water dissolves it freely. Concentrated aqueous solution of caustic potash scarcely affects it, but the dilute solution dissolves it readily.

This resin refuses to crystallize. It has the specific gravity 1.162.

Résumé.—By a comparison of the above it will be seen that the resin of least specific gravity, ("A"), is the softest, and that their consistence increases with their gravity, "C" being brittle at ordinary temperatures.

The accompanying table gives a comparison of the actions of reagents upon the resins. No ultimate analysis was made of them.

	RESIN A.		*RESIN B.*		*RESIN C.*	
	Cold.	*Hot.*	*Cold.*	*Hot.*	*Cold.*	*Hot.*
Sulphuric Acid.	Black at once.	Black at once.	Brown at once.	Black at once.	Brown at once.	Black at once.
Nitric Acid.	Resin slowly turns red. Colorless liquid	Effervesces, forming red liquid.	Resin turns red.	Effervesces, forming red liquid.	Red liquid.	Effervesces, forming red liquid.
Hydrochloric Acid.	No change.	Turns brown.	No change.	No change.	Brown.	Brown.
Solution Ferric Chloride.	No change.	Turns brown.	No change.	Turns dark brown.	No change.	Dissolves with effervescense, forming red liquid.
Solution Potassium Bichromate.	No change.	No change.	No change.	No change.	No change.	No change.
Solution Potassium Bichromate, then Sulphuric Acid.	Turns brown.	Effervesces, forming green liquid, if resin is in small quant's	Turns brown.	Effervesces, forming green liquid.	Effervesces, forming green liquid.	Effervesces, forming green liquid.
Bromine.	Turns red.		Forms red liquid, with effervescense.		Forms red solution.	

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*The crude mixture of resins dissolves in these menstruums. It is scarcely necessary for us to say that under these conditions the real menstruum is a liquid of which the resins "A" and "B" are a part, and which differs in solvent action from the liquid employed to dissolve them severally.

Glucosid.—The filtered aqueous solution from the resins, deposited after standing some days, crystals of a tasteless, odorless, substance that recrystallized from alcohol by spontaneous evaporation, in transparent groups. This substance was soluble in ether and alcohol, but insoluble in water or acidulated water. It was extracted from dilute sulphuric acid, by agitation with sulphuric ether, and, upon boiling with dilute sulphuric acid, neutralization with carbonate of barium and filtration gave a heavy precipitate with Fehling's solution. Upon comparison with the *Magnolin* of Proctor, it was found to differ in this latter reaction from that substance, although resembling it in appearance. We did not obtain enough for a combustion and do not presume to affix a name.

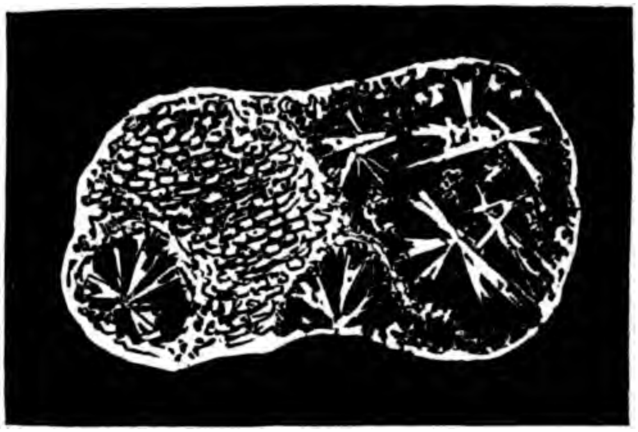

FIG. 119.

Crystals of the Glucosid from Magnolia bark.

Fluorescent Product of Magnolia Glauca Bark.—This substance resulted from a manipulation that was designed to obtain crystals of an alkaloid, but which resulted in the production of an intensely fluorescent, white, crystalline body. That this substance is an erratic product of decomposition, and not an educt of the plant is assured by the fact that repeated endeavors to obtain it from the recent tincture resulted in failures, and that a reserved portion of the tincture that produced the specimen was not fluorescent and did not yield fluorescent liquids by any manipulation.*

The supernatant liquid from which the resins and glucosid were separated gave perceptible reactions with alkaloidal reagents, but we could not separate an organic base from it. In endeavoring to do so we obtained a peculiar body that failed to be reproduced under similar conditions. It had marked properties, but is undoubtedly a product, and not an educt. We therefore record its properties as follows.†

Preparation.—The bark of Magnolia glauca was percolated with alcohol and the alcohol distilled, some water being added towards the end of the process. Upon cooling, water in excess was added, slightly acidulated with hydrochloric acid, and after standing twenty-four hours filtered to separate the resins.‡

The filtrate was evaporated to a syrupy condition,§ rendered slightly alkaline with ammonia water, and agitated with successive portions of sulphuric ether. The ethereal liquids were then evaporated, water, acidulated with hydrochloric acid, being added towards the end of the process. This liquid was filtered,‖ and evaporated spontaneously, some weeks being necessary to effect this purpose.

The result was a dark red, resinous amorphous mass. It dissolved readily in alcohol, and a very small amount of the solution imparted an intense fluorescense to alkaline water. Investigations showed that it was a mixture of an amorphous resinous body,¶ and a crystalline white substance. In order to purify it the mixture was extracted with absolute alcohol and filtered, and the filtrate evaporated. The dark red residue was repeatedly exhausted with benzol** and the filtered solutions evaporated. The product was a nearly white crystalline crust.

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*Prof. Warder thought that an obscured fluorescense was observed when the tincture was dropped into dilute ammonia water. Our subsequent investigations demonstrated that the phenomenon observed was entirely distinct from the fluorescense of the substance under consideration.

†Every endeavor to reproduce it resulted in failures. We have deposited a specimen of it in the cabinet of the Philadelphia College of Pharmacy for future investigators to examine if desirous.

‡For examination and description of these resins see preceding

§This filtrate gave reactions with all the alkaloidal reagents, but being impure, this fact was not considered conclusive evidence of the presence of an alkaloid.

‖The solution was still much colored, containing resinous bodies, and reacting with alkaloidal reagents. After the evaporation it contained much resinuous matter insoluble in water, and the alkaloidal reaction had disappeared.

¶This resinous substance either possessed fluorescent properties, or it was impossible to entirely free it from the other body.

**While some other liquids were better solvents than benzol, they took up the coloring matters. The clearest line of demarkation was drawn by benzol, which separated the peculiar substance almost pure white. The crystals from benzol were also superior to those from other solvents.

Properties.—This substance when pure is tasteless, white and crystallized readily from most solvents that evaporated spontaneously, but with chloroform tends to produce a glassy deposit. It freely dissolves in anhydrous alcohol, chloroform, sulphuric ether, and officinal alcohol (specific gravity 0.820); sparingly in benzol, carbon disulphide and water. It is more soluble in alkaline than in pure water, and less soluble in acidulated water than in either. The solutions are fluorescent (blue); the alcohol solution being a beautiful azure blue; the alkaline, an intense deep blue. This latter is yellow by transmitted light, but the other solutions are colorless. It was not alkaloidal.

Prof. Robert Warder gave this substance some attention, but without result other than to confirm the foregoing description. There was not enough to make a combustion.

MEDICAL HISTORY AND PROPERTIES.—Schoepf, 1787,[*] ascribes to Magnolia glauca bark, "tonic, subastringent and antifebril properties" and to the seed, "stomachic properties." He states that a decoction is used for diarrhoea and phthisis.

Barton, in his collections, 1798,[†] classes Magnolia with the native tonics, stating that "The bark of this is an agreeable aromatic, tonic, bitter medicine." He also states that "In Virginia, a spirituous tincture of the cones, or seed-vessels of the Magnolia acuminata, which is commonly called Cucumber-tree, has been used, and we are told advantageously, in rheumatic complaints,"[‡] and, that in Florida, associated with Serpentaria, it was used in treatment of intermittent fever.

This mention by Barton really introduced the drug to the notice of the profession, and in 1802, Magnolia glauca was the subject of a thesis by Thomas D. Price (upon graduating from the University of Pennsylvania) which was considered sufficiently important to appear in pamphlet form. In this paper, a number of experimental investigations and clinical cases were tabulated, tending to show that the powdered bark in doses of 30 to 60 grains, reduced the frequency and increased the fullness of the pulse, the conclusion being that it could be used as a tonic or even as an antiperiodic to replace cinchona. Dr. Price also made a number of crude investigations of a pharmacal nature to determine its constituents, but none of them are entitled to recognition, other than that the best solvent employed was proof spirit which extracted the characteristic principles most perfectly.

In 1806, a second inaugural dissertation was presented by Mr. John Floyd, to the University of Pennsylvania, on the medical action of Magnolia Umbrella and Magnolia acuminata, which also appeared in pamphlet form, with a frontispiece engraving, natural size, of the leaf and flower of Magnolia acuminata. The result of these investigations indicated that either the powder of the bark, the infusion, or the resin of these species of Magnolia accelerated the pulse and increased its fullness, the maximum being about 40 minutes after administration.[§] The most marked effect followed the use of the resin, in doses of from 14 to 18 grains.

Coxe[‖] states that bark of Magnolia glauca has been used in the cure of intermittent and remittent fevers, as well as those of a typhoid type. However, he did not consider it of primary importance.—Zollickoffer[¶] accepts the value of the Magnolias as tonics, but presents no experience of of his own.—Rafinesque[**] states that the Indians of the South, and the settlers, used the bark in substance and in tincture, in intermittants and in rheumatism, and the cones in tincture as a stomachic and prophylactic. He adds however a word of caution, "their use is improper in all inflammatory fevers and the abuse of their tinctures is hurtful."

The New York edition of the Pharmacopœia (1830) recorded the medicinal uses of the drugs considered, and of Magnolia glauca says, "Tonic, stimulant, diaphoretic. Dose one scruple to one drachm."

In the first edition of the United States Dispensatory, 1833, a synopsis is made of the accepted uses of the various parts of the tree, evidently from the literature we have already presented, as nothing original is offered, and this, in substance, is continued in each revision of that work until the present day.

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[*] Materia Medica Americana, 1787, p. 91.

[†] He refers to Dr. Duncan's Commentaries, 1793. Vol. xviii p. 445.

[‡] Collections for a Materia Medica, part 1st, p. 13 (edition of 1810).

[§] This does not altogether agree with Dr. Price.

[‖] American Dispensatory 1825, and other editions.

[¶] A Materia Medica of the United States, 1826, p. 107.

[**] Medical Flora and Botany of the United States, 1830, p. 31.

Dr. Z. S. Wilson,* 1854, called attention to the fact that the scalded leaves of Magnolia tripetala, had been used by himself, with satisfaction, as a dressing for blistered surfaces, being less offensive than cabbage leaves.

Résumé—It will be seen in our paper on the constituents of the magnolia bark, that a volatile oil, bitter resins, and the crystalline substance magnolin are found in the bark of all species. It is probable that the associated actions of these bodies may be of value in certain desease expressions, but, the well known similar effects of other common drugs render it unnecessary for physicians to resort to magnolia at present.

That this striking American tree should have led the early settlers to hope to obtain from it a valuable medicine is not improbable, but it has failed to come into popular use; was not used by the Indians; has remained for fifty years a cumberer of the pharmacopœia without impressing the medical profession, and presents no striking chemical constituents. We may therefore conclude that it promises little.

Medical and Pharmaceutical References to Magnolia.

1787.—Materia Medica Americana, David Schoepf, p. 91.
1793.—Barton's Collections for a Materia Medica, Vol. I., p. 14 (edition 1810).
1802.—Inaugural Dissertation on Magnolia Glauca, Thos. D. Price, pp. 1 to 40.
1806.—Experimental Inquiry into the Medical Properties of the Magnolia Tripetala and Magnolia Acuminata, John Floyd, pp. 1 to 33.
1820.—House Surgeon and Physician, Hand, p. 235.
1821.—Supplement to the Pharmacopœia, London, p. 148.
1822.—Sequel to the Pharmacopœia of the United States, Bigelow, p. 253.
1825.—The American Dispensatory, Coxe, p. 377 (and other editions).
1826.—A Materia Medica of the United States, William Zollickoffer, pp. 105 to 107.
1827.—Outlines of Lectures on Materia Medica and Botany, W. P. C. Barton, p. 204.
1830.—The Pharmacopœia of the United States, (Philadelphia), p. 35.
1830.—The Pharmacopœia of the United States, (New York), p. 44.
1830.—Medical Flora and Botany of the United States, Rafinesque, Vol. II., p. 31.
1830.—Introduction to the Natural System of Botany, Lindley, p. 24.
1833.—Prodrome of a Work to Aid in the Teaching of the Vegetable Materia Medica, W. P. C. Barton, p. 67.
1833.—Dispensatory of the United States, Wood & Bache, first edition, p. 401.
1834.—American Journal of Pharmacy, p. 285.
1838.—Flora Medica, Lindley, p. 23.
1840.—The Pharmacopœia of the United States, p. 46.
1840.—Pharmacopeé Universellé, Vol. II., p. 7.
1843.—American Journal of Pharmacy, p. 89.
1843.—General Therapeutics and Materia Medica, Dunglison, second edition, Vol. II., p. 46.
1846.—Elements of Materia Medica and Therapeutics, second edition, Pereira, Vol. II., p. 743 (and other editions).
1847.—Materia Medica and Therapeutics, Royle (Carson's edition), p. 248.
1847.—Medical Botany, Griffith, p. 96.
1848.—Dispensatory and Formula, Mayne, (Griffith's revision), p. 276.
1849.—Elements of Materia Medica and Therapeutics, Kost, p. 439.
1849.—Indigenous Medicinal Plants of South Carolina, Porcher, (Report of the American Medical Association), p. 693.
1850.—The Pharmacopœia of the United States, p. 52.
1850.—Medicinal Plants of the United States, Clapp, (Report of the American Medical Association), p. 726.
1852.—The Eclectic Dispensatory, King & Newton, p. 256.
1854.—American Journal of Pharmacy, p. 535.
1857.—Materia Medica and Therapeutics, Mitchell, p. 577.
1860.—The Pharmacopœia of the United States, p. 60.
1862.—American Journal of Pharmacy, p. 29.
1870.—The Pharmacopœia of the United States, p. 59.
1872.—Pharmacopoea Homoeopathica Polyglotta, p. 191.
1872.—American Journal of Pharmacy, p. 145.
1873.—Dictionary of Pharmaceutical Sciences, Sweringen, p. 256.
1875.—American Journal of Pharmacy, p. 179.
1876.—American Journal of Pharmacy, p. 279.
1877.—Encyclopedia of Pure Materia Medica, Allen, Vol. VI., p. 142.
1878,—Dispensatory and Pharmacopœia of North America and Great Britain, Buchanan and Siggins, p. 199.
1879.—The National Dispensatory, Stillé and Maisch, p. 874, issued in 1882.
1880.—The Pharmacopœia of the United States, p. 215.
1882.—Dictionary of Economic Plants, Smith, p. 255.

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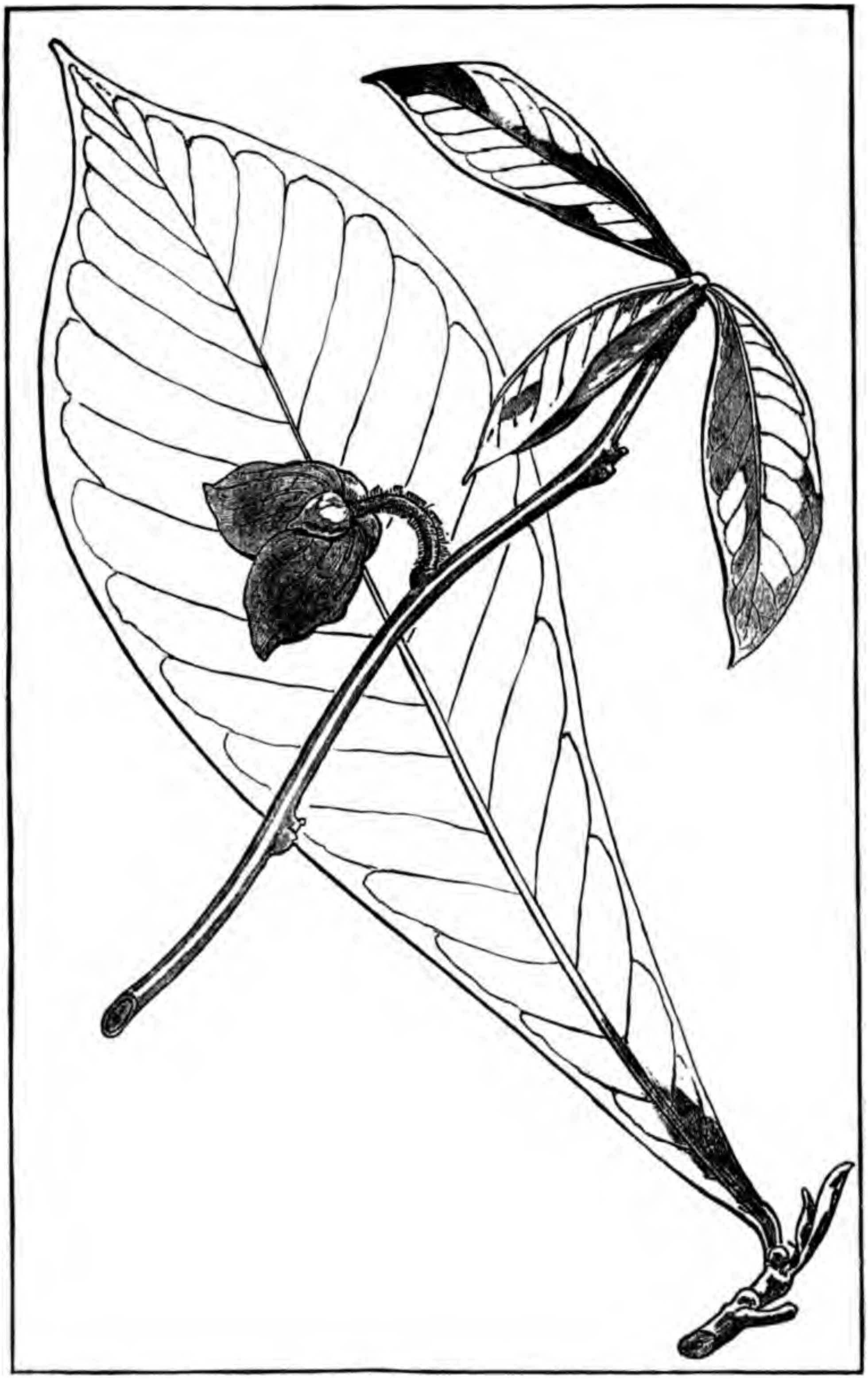
*American Journal Pharmacy, 1854, p. 535.

PLATE XXXIII.



ASIMINA TRILOBA; (Flowering branch and mature leaf.)
(NATURAL SIZE.)

ASIMINA TRILOBA.

PAPAW.

PART USED.—The seeds of Asimina triloba *Dunal.*

Natural Order Anonaceæ, Tribe Unoneæ.

BOTANICAL DESCRIPTION.—Papaw grows most common in the Ohio Valley. It is found rarely in western New York extending through central and eastern Pennsylvania and south to Florida, west to eastern Kansas. It is most common in the states bordering the Ohio river and in Tennessee and Arkansas.

The plant is usually a shrub six to ten feet high and generally grows in open woods or in the borders of the woods, a woodland pasture, or any rich, shady soil, especially the rich bottoms are favorite habitats of the plant. In such situations it sometimes reaches a height of thirty feet and becomes a small tree a foot or more in thickness.

The flowers are developed in the spring, the latter part of April, and are bourne, solitary, or sometimes in pairs, from the axes of the lower leaf-scars of the last year's branches. They are always on the new wood, hence near the end of the branch, and from one to three inches below the tips, and there are generally two to four flowers on each branch. At the time the plant blossoms the leaves are but partly expanded.* They are produced from the termined bud of the branch, the opening bud being bent to one side.

The flowers are bell-shaped and pendant, (see plate xxxiii) and have a color, rare among flowers, which is a dull brown. The penduncle is a little over half an inch long, and is curved downward. The calyx is of three concave acute sepals, lying close to the petals, and about one-half their length. The calyx and penduncle are green, and covered with a short rusty pubescence.

The petals are six in two circles, of three each; the exterior petals are much larger then the inner and longer. When the petals expand from the bud, they are only partially grown and are of a green color. They grow rapidly, however, and turn darker and darker until they become a dark brown, or more correctly, a dark wine purple color. The three inner petals are marked with a lighter band near the base.

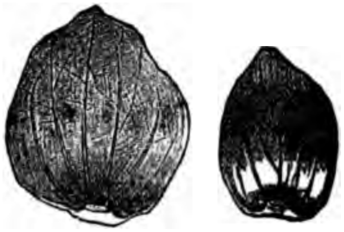


FIG. 120.
An outer and inner petal of Asimina triloba.

The stamens are very numerous and inserted in a globular head on the enlarged receptacle. They are packed very densely and form apparently a globular ball in the center of the flower.* The pistils are naturally six, usually three to five, bourne on the summit of the receptacle and protruding through the globular mass of stamens.

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*The pictures of Asimina in both Baillon's History of Plants and Gray's Genera represent the leaves far more advanced than they are when the plant is in bloom around Cincinnati. When the flowers begin to expand the leaf-bud is just beginning to unfold, and when the flowers have mostly fallen the leaves are developed but very little.

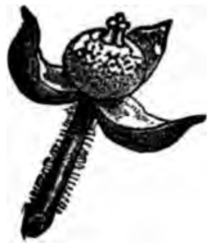

FIG. 121.

The calyx, globular ball of stamens, and the three protruding stigmas of a flower of Asimina triloba; the petals being removed.

The leaves are when mature, nine to twelve inches long, obovate, smooth, veiny, and with entire margins. They are acute at apex and taper very regularly at the base to a short leaf-stalk, and are arranged somewhat in two rows along the sides of the branch. When bruised the leaves have an unpleasant odor.†

But few of the flowers are fertile and produce fruit, but often such as are fertile bear two to five fruit attached to outer edge of the receptacle and hanging almost pendant.

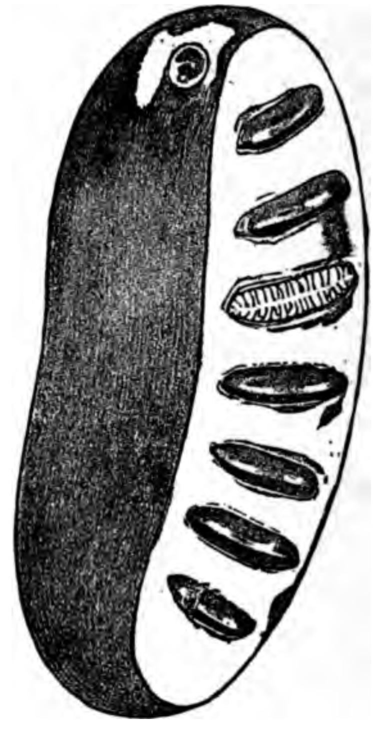

FIG. 122.

Fruit of Asimina triloba, (Papaw.) Cut to show one row of protruding seeds; the third seed from top cut into, showing runcinated albumen.

DESCRIPTION OF THE FRUIT.—The skin of unripe, full-grown fruit is green and covered with glaucous bloom. The green fruit are very firm breaking with a brittle fracture, which usually intersects a seed, from which the unripe flesh peels smoothly, disclosing the brightly polished dark brown seed. The flesh of the unripe fruit is green next to the skin, and gradually changes to white until the green color disappears about the eighth of an inch from the surface. The broken unripe papaw has a fetid odor which is sickening to all persons reminding somewhat of the Ailanthus, and the taste of the flesh is nauseating and unbearable.

The mature fruit is nearly cylindrical, rounded at both ends‡ and curved, as shown in our figure. The stem is attached obliquely at the apex on the curved side. Owing, however to imperfectly developed seed, the fruit is often imperfect in shape and irregularly swollen.

Within, the perfect papaw contains two rows of seeds, imbedded in the flesh and arranged horizontal to the axis of the fruit. Each seed is enclosed in a pulpy membranous covering, known to botanists as an aril. They are about an inch in width and one-fourth an inch in thickness. The surface of the seed is of a smooth brown color, which becomes lighter upon drying. The seed contains a small embryo imbedded near the apex of a large, horny, runcinate albumen.§ The irregular lobes of this is im-

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*A close examination will show them to be spirally arranged. Each stamen has two anther cells attached extrorsely to the broad connective which produces at the top a dilated glandular tip. So closely packed are the stamens that the glandular tips are all that is seen of them by looking into the flower.

†Boys often chew the leaves of the papaw in imitation of tobacco chewers, as the saliva is colored brown by chewing them.

‡We have noticed a very large number of the fruit, and have seen none pointed at the apex as shown in Gray's Genera, (plate 27).

§The runcinate albumen of the seed, shown in the third seed from the top in figure 122 is an important character of the entire natural order Anonaceæ. Some of the ambiguous genera are distinguished from the Magnoliaceæ by this character alone.

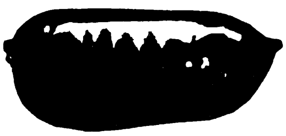

FIG. 123.
A seed of Asimina triloba, Papaw seed.

pressed on the surface of the seed giving it a rib-like marking. It is not unusual for a seed to fail to develop, (a black speck remains in the pulp, marking the position the seed would occupy,) and then the fruit is constricted at that part. As these imperfect seed occur in any location, the fruit is often irregularly swollen. The perfect fruit ranges from one and a half to two and a half inches in diameter and from three to five inches in length, although they are often of less size and occasionally larger. They weigh from four to twelve ounces; if less than this, they are imperfect. When the edible fruit ripens,[*] the green coloring matter changes to yellow, beginning at the surface, and the tough flesh softens from the skin inwardly.[†] It becomes musty, then pasty and slippery, finally the skin turns black and the flesh assumes a semi-transparent nature in blotches and a brownish color, this being especially the case between the seed and the skin.

The original odor and taste disappear to be replaced by an ethereal flavor, peculiar in itself, but which is highly relished by persons who are fond of the fruit. They have when ripe a sweetish taste, which is often subacid owing to fermentation.[‡] They will ripen before, but only attain perfection after exposure to a severe frost. Ripe (black) papaws are wholesome, and can be eaten freely without producing any disarrangement of the normal functions, (see medical properties.) In cities like Cincinnati, where the shrub grows, the fruit in the last of September and the first of October is sold quite largely in the market, but is not shipped to other cities to any great extent.

COMMON NAMES.—In its native habitat the plant is known to the inhabitants as papaw, (sometimes spelt pawpaw,) a name given it from a fancied resemblance of the flavor of the fruit to that of the true "papaw" of the tropics.[§]

We find this name applied by the first botanists and naturalists who mention the plant. The early French inhabitants of Louisiana, called the plant, Asiminer, (whence the botanical name for the genus.[‖])

In old works the plant is called American Custard Apple, but we are satisfied that the name Custard Apple is never by country people given to the plant.

"Monin" is a name for the shrub we find in Baillon's work, but we are unable to learn that it is used anywhere else.

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[*] Papaw eaters recognize two varieties of the fruit, the white and the yellow. The yellow papaw only is edible, but there is no known difference in the trees. White papaws retain their disagreeable odor until they decay; they do not turn yellow upon ripening, and will sicken those who highly relish the other fruit.

[†] This is the condition that persons who can barely eat them, prefer the fruit. The flavor has been compared with bananas to which there is perhaps a resemblance.

[‡] The papaw is a cultivated relish. Few persons who reach maturity without acquiring a fondness for them can endure their flavor in any stage.

[§] The true *papaw*, Carica Papaya, is a native of tropical America, but has been introduced and now common in both the Indies. Although an exogen it has an erect unbranched stem, ending in a tuft of large leaves, after the manner of a palm. The fruit when ripe is eight to ten inches long, and resembles a mellon. It contains an acrid milky juice, but is eaten with sugar by the natives. The name, "papaw," is of Indian (Hindoostan) origin, and was first applied to this fruit. In what manner it became attached to our species of Asimina is not positively known, but it was probably by negro slaves brought from the West Indies.

[‖] We do not know the derivation of this name. It was used by the early French, and Adanson who first applied it in botany gives "Canad" as its authority, probably deriving it from the Canadian French and refering to his source of information. Dr. Charles Rice has kindly given us the following notes on the subject: "Regarding the words *Asimina* and *Monin* I can give no certain information. Wittstein states (in his Etymol Botan, Worterbuch) that Asimina is a Canadian name. To me, there seems to be a curious coincidence between the two words, in so far that both can be interpreted as "refering to monkeys." Monin is an obsolete French term for ape, monkey; the same occurs in Italian "monna" "monnino" (the word *monna* meaning also "good woman" and is supposed to be a contraction of madonna); Portugese "mounino," etc. Now, *simia* is Latin for ape, and this has gone over into modern languages likewise, viz. French "simien" (as adjective) etc. Whether there is really an etymological connection between the *simia* and the "asiminer," I cannot say, but I mention the above as a curious fact."

Botanical History.—The papaw belongs to a family which is common in the tropics, but is represented in this country by the genus Asimina alone. Besides the plant under consideration, there are three other species in the United States, but they are confined to the extreme South, mostly in Florida, and are so rare as to be of little interest.[*] This species is hence of much botanical interest, being the only northern representative of an otherwise tropical or semi-tropical order.[†]

The earliest mention probably, of this plant, is in 1557, by the Portugese narrator who described the journey of De Soto in America.[‡]

The shrub was collected by three explorers in the early part of the eighteenth century; Clayton,[§] who described it in his Flora Virginica (1739);[‖] Catesby,[¶] who also described it, and illustrated it with a page engraving;[**] and Bartram,[††] who sent it to Collinson,[‡‡] and was the first (1736) to introduce it into England.

It was mentioned in several works of natural history in the last century.[§§]

The early collectors described the plant under the generic name Anona,[‖‖] which had, from the earliest times, been applied to a large family of plants of the tropics, that produces the Custard Apples,[¶¶] and Linnæus adopted the name (spelling it Annona);[***] he called the shrub Anona triloba, taking the specific name from the pistils.[*] Under this name it is known in all the early works, to the beginning of the present century. Adanson,[†] 1763[‡] defined and named the genus Asimina,[§] but his work, being only a description of families, he did not apply a specific name to the plant.

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[*] These species are Asimina grandiflora, *Dunal;* Asimina parviflora, *Dunal;* and Asimina pygmæa, *Dunal.*

[†] Dr. E. M. Hale contributes an article to a recent number (Oct. 10, 1886) of the *Chicago Inter-Ocean* headed as follows: "The Paw-paw, a northern tropical fruit, the sole survivor of the ante-glacial age."

[‡] De Soto and his men met this fruit, according to the narrator, in the summer of 1541. The narrative was published in Portugese in 1557, by a gentleman who claims to have accompanied De Soto on his four years' exploration of southern United States. The name of the author is not known: he is only called a "gentleman of Elvas."

Hakluyt published an English translation of this narrative in 1609, and W. B. Rye's reprint (1851) of Hakluyt's translation forms the 9th volume of the publications of the Hakluyt Society of London.

Of Asimina the narrator says: "It is a fruit like unto peares riall, growing on a plant like ligoacan, and having a varie good smell and an excellent taste. It is planted by the natives through all the countrie."—*Pickering.*

[§] See note[*] page 30, vol. ii.

[‖] Flora Virginica, 1739, p. 83. Described under the old Linnæan name "Anona foliis ovali-lanceolatis glabris nitidis planis." The synonyms given are mostly incorrect.

[¶] See note,[§] page 30, vol. ii.

[**] Natural History of Carolina, Florida and the Bahama Islands, Mark Catesby, London, 1743, vol. ii., plate 85.

Catesby describes it under the name "Anona fructu lutescente, lævi, scrotum Arietis referente." His plate 85 is a fair representation of the shrub, inaccurately however showing flowers, mature leaves and ripe fruit on same branch. The flowers are not the right color, being greenish white instead of brownish purple, and the fruit is unnaturally colored a deep golden yellow.

[††] See note,[‡] page 293, vol. i.

[‡‡] See note,[††] page 30, vol. ii. Collinson was not the author of a work on botany, but he was an ardent cultivator of rare plants and left manuscript notes. It is one of these notes that is authority for the statement that the shrub was introduced in 1736.

[§§] Brickwell, (1743,) states inaccurately, as follows: "The Papaw tree is not large, being only about eight or ten inches in diameter, but has the broadest leaves of any tree I ever saw in the woods of Carolina. It bears an apple about the bigness of a hen's egg, which contains a large stone in it; when it is ripe it is of a beautiful yellow color, and is soft and sweet as any fruit can be. The planters make puddings, tarts, and many other dishes of the fruit of this tree."

Kalm who evidently only knew of the fruit by hearsay, as he did not travel where it grows, incorrectly refers to it as "Annona muricata, the Custard apple."

[‖‖] Anona fructu lutescente, lævi, scrotum Arietis referente.—*Catesby.*

Anona foliis lanceolatis, fructibus trifidis.—*Linnæus.*

This name, Anona, is of native (East India) origin, and as stated by Linnæus when he applied it to this genus, is of unknown meaning.

[¶¶] The Custard Apple is a kind of family name applied to the fruit of a number of species of Anona found in the West Indies and Tropical America. The most common are the Anona muricata or Sour Sop, and the Anona squamoso or Sweet Sop. These fruits are hard and scaly outside, but the pulp is soft and has a pleasant flavor and is much esteemed, especially by the negroes. It contains numerous small seeds which make it disagreeable to eat.

[***] The Linnæan genus Anona is still retained, greatly changed, however, by the removal of many of the original species and the addition of newly discovered ones. It comprises about fifty species native, excepting a very few, of the tropics of America. The flowers are quite analagous to those of Asimina, and Linnæus, who drew his characters mostly from the flowers, naturally included both in the same genus. The fruit, however, is widely different, consisting of numerous, fleshy, coalescent ovaries, something of the nature of a pine apple.

Michaux,[‖] in 1803,[¶] separated the plant from the genus Anona, calling the shrub Orchidocarpum arietinum,[**] but his name was not used by any other writer, as a few years afterwards Dunal,[††] 1817,[‡‡] published an elaborate revision of the entire family of Anonaceæ, referring this plant to Adanson's genus, with Linnæus' specific name as Asimina triloba, which name most writers have since adopted and used.

In 1807,[§§] Persoon referred the plant to the genus Porcelia,[‖‖] under the name Porcelia triloba, and in 1837,[*] Torrey and Gray assigned it to Uvaria, under the name Uvaria triloba.[†] These views however, were followed but by few writers, and are now entirely rejected.

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[*] The name "triloba" is not accurate, as instead of having a three-lobed ovary the flower has three (or more) distinct pistils. The name has caused, chiefly in old European works, a wrong conception of the nature of the fruit, and we find such terms as "trifid-fruited Custard apple" applied to it. Each ovary that developes forms a separate fruit, which is not lobed at all.

[†] The name of Adanson justly celebrated for the part it bears in the pioneer work of establishing a natural system of classification, deserves more than a passing notice in this work. Michael Adanson was born in 1727 at Aix, in France, but was raised in Paris, where his father moved when Adanson was a child, three years old. His father was in the service of the Archbishop of Paris, who provided for the children of Adanson, settling a canonry on the subject of this sketch. The revenue from this enabled young Adanson to live in a modest style and to obtain a collegiate education. He was destined for the ministry, but showed no special aptitude for this calling, nor, indeed, for any, until becoming the owner of a microscope he found great interest in examining objects of natural history and determined to become a naturalist. He obtained instruction under the celebrated Reaumer and Bernard de Jussieu, and had the advantage of access to their cabinets and the Jardin des Plantes. At the age of twenty-one he made a trip to Senegal to study objects of natural history of that country, then almost entirely unknown to the world. On his return after five years, he found himself without resources, but obtaining aid from M. de Bombarde he published in 1757 a short account of his observations under the title "Historie Naturalle du Sénégal." He was compelled, however to abandon the project of publishing a complete history in eight volumes which he contemplated.

At that time Linnæus was at the height of his career, and his system of classification of plants was exciting the wonder of the scientific world. Emulous of Linnæus and jealous for the reputation of the French, who had heretofore been leaders in this branch of science, Adanson set himself to work to construct a system builded on the natural relation of plants, as indicated by Tournefort, which was from its fundamental principle totally at variance with that of Linnæus. The result was published in 1763 in two volumes under the title *Familles des Plantes*. This work, the result of profound study, was in advance of the botanical knowledge of the day, and did not secure the recognition it deserved. Besides, it totally rejected the principle of Linnæus, which were at that time adopted by botanists of all other nations of Europe. Unfortunately, also, Adanson introduced into the work, a peculiar system of phonographic names, which were without reason, and opened the work up to the ridicule of its numerous opponents. Although, never adopted, the work of Adanson did much good in paving the way for the reception of Jussieu's great work which appeared twenty-six years later, and finally overthrew the Linnæan system.

After the publication of "Familles des Plantes" Adanson did little to be recorded. He was in reduced circumstances and employed himself on a chimerical project of a vast "Encyclopedia of Natural History" to contain 200,000 subjects and 40,000 illustrations and to consist of 200 volumes. It is needless to say it was never published.

During the French revolution Adanson was deprived of the little property that was not lost during his absence from France, and for several years he lived in abject poverty. Finally, a small pension was obtained from the French Government, but his health had been undermined by exposure and hard work, and after a long illness he died in 1806 in his eightieth year.

[‡] Familles des Plantes, M. Adanson, Paris, 1763, vol. ii., p. 365.

[§] See note‖, page 51.

[‖] It is evident that Michaux acted independently of Adanson's previous work as he states. "I have deemed it preferable to establish this as a new genus, rather than to refer it to related ones, which are as yet doubtful."

[¶] Flora Boreali-americana, Andreas Michaux, Paris, 1803, vol. i., p. 329.

[**] It is well that this absurd name was never adopted. It means literally "testicle-shaped fruit like a ram's."

[††] Michel Félix Dunal was a French botanist in the beginning of the present century. His attention was directed to the study of systematic botany, and although he did not publish any general work he showed great talent in elaborating the difficult genus Solanum and the Natural Order Anonaceæ. His work on the Anonaceæ was published in 1817, and contains thirty-five plates and descriptions of all the then known species.

[‡‡] Monographie de la famille des Anonacées, M. F. Dunal, Paris, 1817, p. 83.

[§§] Synopsis Plantarum, C. H. Persoon, Paris, 1807, part 2nd, p. 95.

[‖‖] The genus Porcelia established by Ruiz and Pavon in 1794 for a few Peruvian species is probably merely a subgenus of Uvaria, (see note† p. 54,) and is admitted with doubt by Bentham & Hooker. It seemed to agree with Uvaria in most important characters, but has a different geographical range.

DESCRIPTION OF THE DRUG.—The fruit is described on page 50 of this publication.

The tree bark is of a brown color externally, darker in young plants, and on old trees is covered with large ash colored blotches. The inner bark has a tough fibrous texture extending almost to the surface, and is used by fishermen for stringing fish,[‡] and history states that the Indians used it for withes and strings in making and mending fish nets and garments. The odor of the fresh bark is fetid, the taste bitter and disagreeable.

The root bark is of a dark brown color externally, white within when fresh, but darkens and changes to black upon exposure. It is also fibrous, but more spongy than the tree bark. The odor of the fresh root bark is less fetid than that of the tree, but it is more bitter to the taste.

The leaves have an unpleasant odor when bruised, and disagreeable taste when chewed.

Internally the fresh seeds of the ripe fruit are white, but turn dark upon exposure or drying. They are nearly tasteless, but contain a volatile oil that produces a rather fragrant sensation when the breath is exhaled through the nostrils, while chewing the seed. A disagreeable acrid sensation follows the chewing of old papaw seed.

CONSTITUENTS.—There is no record of a chemical examination having been made preceding our own.

All parts of the tree and the green fruit, contain a volatile oil that imparts the disagreeable odor heretofore mentioned. The bitterness of the bark is due to a bitter extactive matter, that we could neither crystallize, nor separate from extraneous substances by means of solvents. The characteristic constituent is an alkaloid which we find in the seeds, to which we have affixed the name *Asiminine*, and describe as follows:

ALKALOID OF ASIMINA TRILOBA.—ASIMININE.—*Preparation.*—Extract the ground seed with alcohol; evaporate the alcohol, adding towards the last water enough to precipitate the oils, and acidulate with acetic acid; stir well, and after twenty-four hours filter; add ammonia water cautiously to the filtrate until in slight excess, care being taken to avoid a strong alkaline reaction. Collect the precipitate, and while moist agitate with successive portions of sulphuric ether, and decant the etherial layers; then mix the etherial liquids; evaporate and dissolve the residue in a little alcohol. To this solution, add hydrochloric acid in slight excess, when, if concentrated, a magma of crystals of the hydrochlorate of the alkaloid will be produced. If the solution is dilute, evaporation will be necessary.

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[*] Flora of North America, Torrey & Gray, New York, 1838, vol. i., part 1, p. 45.

[†] The genus Uvaria, to which Torrey and Gray referred our plant, was established by Linnæus, and, as now defined, includes mostly plants of Asia. It differs from Asimina in several characters; the fruits have an analogous structure to those of Asimina, but are much smaller and numerous, being in most species a cluster of small berries resembling grapes, hence the name Uvaria from *uva*, the Latin of grape. The floral envelopes are in two series and the petals instead of being valvate are imbricated in the bud.

Prof. Asa Gray in none of his later works has included the plant in this genus, but has uniformly adopted Dunal's classification. Baillon, however, who draws very elastic boundary lines to his genera, still retains the American plant in the genus Uvaria.

[‡] Fishermen along the Ohio river use papaw bark almost exclusively for this purpose. They collect a supply in the spring when the bark slips freely, stripping the young branches.

These crystals are purified, by crystallization from hot alcohol; then dissolved in water and precipitated with ammonia and the amorphous alkaloid dried. The yield is small, but considerable of the alkaloid is lost in the process of purification. In working large amounts an increased yield would result after the first batch.

Properties.—This alkaloid is white, colorless, tasteless and practically insoluble in water. It dissolves freely in ether and alcohol; less freely in chloroform and benzol. Upon evaporation of the solvents it precipitates in an amorphous condition, and we did not succeed in crystallizing it. The soluble salts are bitter and produce copious precipitates with the usual alkaloidal reagents. Salts of asiminine made with the usual acids employed in the commercial production of alkaloidal salts, dissolve freely in water, (except hydrochlorate which is less soluble,) producing bitter liquids, from which dilute alkalies precipitate the alkaloid. We did not succeed in crystallizing either the nitrate or the acetate of asiminine. The hydrochlorate crystallizes when thrown from alcoholic solution, forming beautiful squares. (See figure 124.*) The sulphate formed in lamina of crystalline nature, of which figure 125, (see next page,) is an accurate illustration.

The principal salt, owing to its easy production in a pure crystalline condition will be the hydrochlorate, should this alkaloid come into demand as a medicinal agent.

Hydrochlorate of asiminine is white, odorless, and to the taste at first sweetish, then bitter, leaving a bitter after-taste. It crystallizes from alcohol in transparent square plates, or in groups of crystals, composed mainly of the interlocked sections of cubes.†

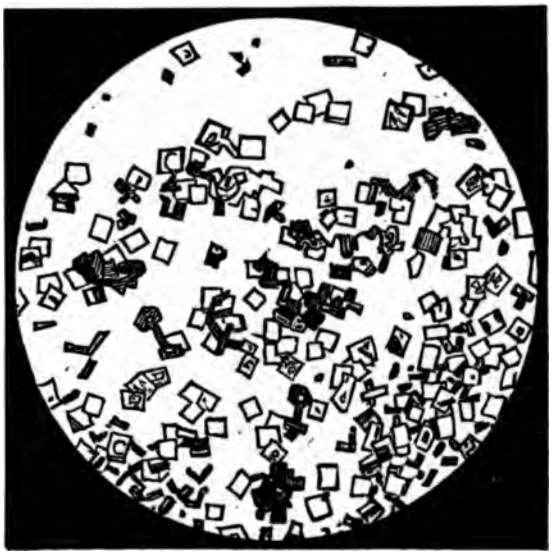

FIG. 124.
Crystals of Muriate of Asiminine, from alcoholic solution.
(Magnified.)

Even if the alkaloid be in minute amount, it forms with nitric acid at once a carmine red, which quickly changes to a deep dark purple color. This reaction is very delicate and is similar to that of concentrated nitric acid on morphine salts, excepting that the color is not *blood* red, and instead of becoming lighter, darkens for a time to purple, and then changes to deep red but not yellow. The inexperienced might possibly confuse this alkaloid with morphine under that similar test. With sulphuric acid it effervesces, dissolves, turns greenish yellow slowly, afterwards yellowish red, then dark red, and the liquid retains this color. Hydrochloric acids does not affect it, but the addition of a little sulphuric acid, and a gentle heat produces a purple color similar to the morphine reaction with the same reagent. Mercuric chloride cause a precipitate in solutions of this salt. Chlorine water does not affect the alkaloid, but the solution of its muriate is precipitated white by this reagent, (distinction from morphine.)

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*These crystals are from acid solution and made by cautiously adding hydrochloric acid diluted with alcohol to a film of the alkaloid that was deposited from an ethereal solution directly upon the slide. This gave better crystals than the evaporation of an aqueous solution.

†These crystals appear upon the slide to be square plates, but are evidently the portions of cubes in which the upper and lower faces only are fully developed.

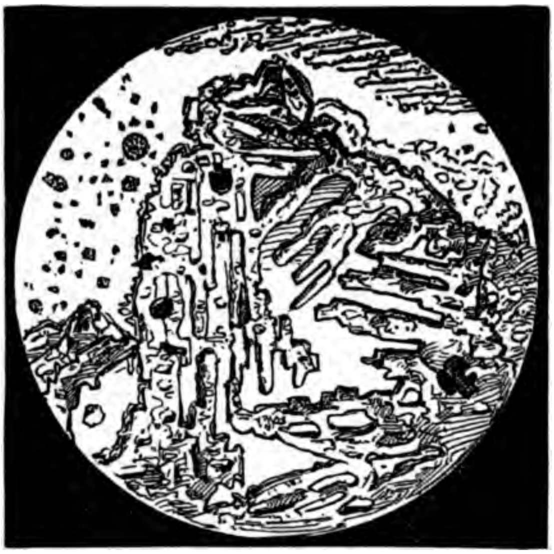

FIG. 125.
Crystals of Sulphate of Asiminine. (Magnified.)

Further examinations of the bark and seed of asimina failed to produce other than the usual constituents of plants.[*]

Medical History.—Owing to the fact that the papaw shrub is rare east of the Alleghany mountains, and that the early medical investigations of American drugs were in the eastern section of our country it was not known in early medical literature. That it would have been studied if more abundant in the settled districts is evident from the fact that Schoepf, 1787,[†] gave it a favorable notice, saying: "The bark and leaves are of a rather bad odor, similar to that of datura. The fruit has a pleasant subacid, sweetish taste, and is edible. The skin of the fruit has a disagreeable terebenthenous taste. A wine prepared from the unripe fruit is odorless and is highly useful in children's sore mouth."[‡]

Barton, 1801,[§] records that he had heard that the dried fruit was purgative, but he had no personal experience with it.

Rafinesque, 1830,[||] reproduces the statements of Schoepf, but adds nothing thereto, although he must certainly have been interested in this peculiar American fruit, so different from any of his native land.

Porcher, 1849,[¶] confuses this tree with that of the papaw of the tropics, the fruit of which has the power to digest fibrine, and his remarks are not applicable to our plant.[**]

Clapp, 1850,[††] has nothing to say for the medicinal properties of the papaw, but states that according to Martins the powdered seeds are used to destroy lice on the heads of children. At our suggestion a concentrated aqueous infusion and a tincture of the seed were employed in the Children's Home of Cincinnati to destroy these insects, but the experiment proved unsuccessful.

King, 1852,[‡‡] states that the saturated tincture[§§] of the seeds is emetic in doses of from ten to sixty drops and that the bark is said to have been used as a bitter tonic by country people, but Prof. King informs us that he has no personal acquaintance with the drug.

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[*] We aim to consider the principles that would characterize a drug as a medicinal agent. The examination as to starch, glucose, ordinary gums, woody fiber, chlorophyl potassium salts, and other salts, etc., are perhaps of interest to some persons, but we feel that such matters are not of practical use to medicine. We, therefore, do not burden our pages with investigating processes that are barren of results and we feel that to consume space with tedious descriptions of the ordinary constituents of every plant would be irrelevant to our subject.

[†] Materia Medica Americana, David Schoepf.

[‡] We can add that the partially unripe fruit is laxative and cathartic. Also, that it sometimes produces a rash in children that resembles the eruption of measles. In one case that came to our notice, the child ate a partially ripe papaw, which was followed by cartharsis and an eruption on the face that lasted some days.

[§] Collections for a Materia Medica, part 2nd, p. 30.

[||] Medical Flora and Botany of the United States, vol. ii., p. 197.

[¶] Indigenous Medicinal plants of South Carolina, p. 697, (Report of the American Medical Association.)

[**] Recently, a substance, papain, (we spell the name without the final *e*, to show that it is not an alkaloid) has been introduced into medicine as a digestive agent. It is obtained from the pulp of the tropical papaw, which will soften tough flesh if boiled with it. Porcher was doubtless led to his error by a paper of Hooker in the Botanical Magazine, to which he refers.

[††] Medicinal plants of the United States, p. 728, (Report of the American Medical Association.)

[‡‡] Eclectic Dispensatory, King & Newton, p. 326.

[§§] The term saturated, was applied to tinctures of a more concentrated nature than the officinal. It was not considered in a literal sense, and few of these preparations were of known composition.

This meager record is all that we can find in American literature. Neither Thompson nor Beach, referred to asimina, and their followers have neglected it. The United States Dispensatory has not honored it by a position in its pages from the first to the last edition, and Prof. Maisch omitted it from each edition of his carefully prepared National Dispensatory. Outside of homœopathy, (see Prof. Hale's paper page 59,) it is unknown in medicine. Like numbers of other products, investigation may yet give to some part of this tree a position as a drug that other remedies cannot replace. In corroboration of our supposition, we commend the reader to Prof. Bartholow's report on the physiological action of asiminine, the alkaloid obtained by us from the seeds.*

A PRELIMINARY STUDY OF THE PHYSIOLOGICAL ACTIONS OF HYDROCHLORATE OF ASIMININE.—(Written for this publication by Prof. Roberts Bartholow, M. D., LL. D., Professor of Materia Medica, General Therapeutics and Hygiene; in the Jefferson Medical College of Philadelphia)—The preparation used in the experiments made with the hydrochlorate of asiminine, was sent to me by Prof. Lloyd, and had the strength of 1-60 grain to the minim. A general view of the results of experiment is given. Experiments of control were conducted simultaneously, and hence, the observations made, can be considered as very closely approximating exact results within the limited range to which they were necessarily confined.

General Effects.—Two distinct stages in the actions of asiminine were clearly defined: a stage of excitement, mental and somatic; a stage of somnolence and torpor. When the effects are produced in frogs after the administration of the solution subcutaneously, the animal manifests much excitement, jumps almost constantly, and on the least touch makes frantic efforts to escape. A peculiar action of the head is then observed; the nose points downwards, and the eyes are closed as a movement preliminary to jumping. It is, obviously, the characteristic action of the animal in jumping into the water with the purpose of swimming. As the influence of the alkaloid deepens these actions become less frequent and are interspersed with intervals of repose, which gradually lengthen. During the period of repose, if not approached or disturbed, a position which is maintained to the end is assumed. The frog rests on the belly; the limbs extended, but not fully; the nose resting on the table; the eyes closed. At first, every minute the following movement takes place: the head is extended forward, the nose pointing downward, and the four extremities are extended outwards and backwards, whilst the toes are expanded, thus stretching the web, the whole action simulating the movement of swimming. The repetition of this action becomes less and less frequent, the periods of repose passing into a condition of somnolence longer in duration, and finally the action is little more than a transient movement of the extremities, in which the toes chiefly participate. During the progress of the action the stupor is always quickly removed by the slightest touch of the head and face. The skin of other parts of the body may be sharply pinched without exciting any indication, if care be taken to avoid pressure on the structures beneath, but the head and face continue to be, in a high degree, sensitive of the slightest impression. The eye reflexes remain sharply responsive.

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*We will add, that we have now in process a considerable amount of the alkaloid and that Prof. Bartholow will use this in disease and note its effects on man. He will announce the result in the usual manner by contribution to some medical journal.

Actions on the Motor Nerves and Muscles.—When the sciatic is isolated it is found to retain its power of response to mechanical, chemical, and electrical irritation. The muscles, when directly stimulated, contract energetically, and are found to retain their normal lifting power, and are capable of their usual working activity. It follows, of course, that asiminine does not act on the motor apparatus of the body.

Action on the Sensory Nerves.—If more extended researches confirm the results here given, we will have added to our resources a useful medicament. The small quantity of the alkaloid available, and the shortness of the time in which the observations could be made have prevented a fuller investigation. So much as follows seems, however, to be a correct inference from the results of the experiments.

When the solution containing 1–60 grain to the minim is applied to the mucous membrane of the lips, a benumbing sensation is experienced. Careful observation demonstrated that in the benumbed area the sense of pain was distinctly lessened, whilst the sense of touch remained normal. It is necessary, however, to employ more concentrated solutions and more freely to ascertain the full extent of this local action.

As respects the sense of touch in frogs, asiminine rather heightened than lowered it in the area of distribution of the fifth nerve, for here the least impression caused active and, prompt closure of the eyelids. The skin of the hind extremities, of the back and belly, remained sensitive to strong impressions, but if great care was taken to pinch up the skin of these parts with a pair of fine forceps without making pressure, no amount of injury, caused the least responsive motion of the distant muscles, or of the heart. If a toe were carefully separated from its fellows, and pinched strongly without changing its position, no effect was produced. When the stupor deepened into a coma-like state, touch became obtunded, for then the sensorium became less able to translate peripheral impressions into consciousness.

Action on the Circulation.—When the full effects of asiminine are produced, if the chest be opened the heart is found acting rhythmically, and at, or about twenty per minute. For a time the pneumogastric responds to faradic stimulation, but the irritability of the nerve diminishes, and apparently becomes extinct before the final cessation of the heart's action. The accelerator apparatus is strongly affected by faradic excitation, and the heart becomes more rapid in movement without any loss of power when the stimulus is applied.

Action on the Respiration.—During the stage of excitement the respiratory movements are hastened without diminution in depth, apparently, but as the effects of the alkaloid on the cerebrum increase, the breathing becomes slower *pari passu.*

Conclusions.—Asiminine acts on the cerebrum causing somnolence, and ultimately stupor and insensibility. The rhythmical movements which occur very frequently during the stage of excitement seems to be purposive in character, and are not convulsive. The stage of excitement corresponds to a state produced by the first impression of various anodyne and hypnotic remedies.

Acting as it does on the centres of conscious impressions, and apparently lowering the pain sense, whilst the tactile sense is preserved, asiminine must be grouped with the anodyne agents. Whether these effects will be confirmed by further investigations, and the anodyne action occur in the higher animals and in man can be determined only when a larger supply of the alkaloid is procured for more extended study.

HOMŒOPATHIC USES OF ASIMINA.—(Written for this publication by Edwin M. Hale, M. D., Emeritus Professor of Materia Medica and Therapeutics in the Chicago Homœopathic College.)—The fruit of the Asimina, when properly eaten, and fully ripe is certainly not unwholesome, as I can personally testify, for in my boyhood days I consumed large quantities without the slightest discomfort. But we were very careful to eat only the custard-like pulp, and avoided the rind.

I have no doubt, but decided medicinal and perhaps toxic principles may reside in the seeds, rind and bark.

There are on record a few cases of poisoning by the fruit, or rather the skin of the ripe fruit, or perhaps the unripe pulp. They were communicated by Dr. H. W. Taylor, of Terre Haute, Indiana.

The symptons produced have a close resemblance to scarlet fever, or a febrile erythema.

The following is Dr. Taylor's report: "Five children ate freely of the papaw, without being fastidiously nice as to the ripeness or greenness. Next morning they seemed a little languid and pale, but the papaw eating went on. About 10 P. M. I found my only boy, aged two years and six months, with a violent fever. He had vomited awhile before I arrived, and I found that he was covered with a bright scarlet eruption. His pulse was 130°, full and steady, and at 1:30 the thermometer remaining in the axilla ten minutes showed a temperature of 105°. Among the vomited ingesta were many small pieces of unripe papaw. The next day the eruption remained in full blush, the temperature dropped to 104°, the fauces were red and swollen, the tonsils and submaxillary glands were considerably enlarged, and a diarrhœa of yellowish discharges set in. Each day the temperature dropped until it was normal; a general desquamation of the cuticle took place, and a carbuncle formed on the anterior aspect of the left thigh, and was two weeks finishing the process of suppuration. The diarrhœa continued more than four weeks, although many remedies were given to check or control it. He complained of frontal headache and nausea. The eruption in all its phases, the fever, the diarrhœa, were much like some cases of scarlet fever. All the other children had the eruption on the neck and upper extremities, all had diarrhœa, lasting a long time after the other symptoms had disappeared."

It would seem that in the above instances the papaw was the cause of the illness. There are other drugs which cause the same phenomena, namely, belladonna, hyosciamus, stramonium, ailanthus, quinine, etc. It will, however, require other experiments to prove the papaw to possess uniformly such effects.

Therapeutically, and according to the homœopathic law of cure, this drug would be curative in Scarlatina, when accompanied by the concomitant symptoms observed in these cases.

MEDICAL REFERENCES TO ASIMINA.

1787.—Materia Medica Americana, David Schoepf, p. 92.

1801.—Collections for a Materia Medica, W. P. C. Barton, part 2nd, p. 30.

1830.—Medical Flora and Botany of the United States, Rafinesque, Vol. II., p. 197.

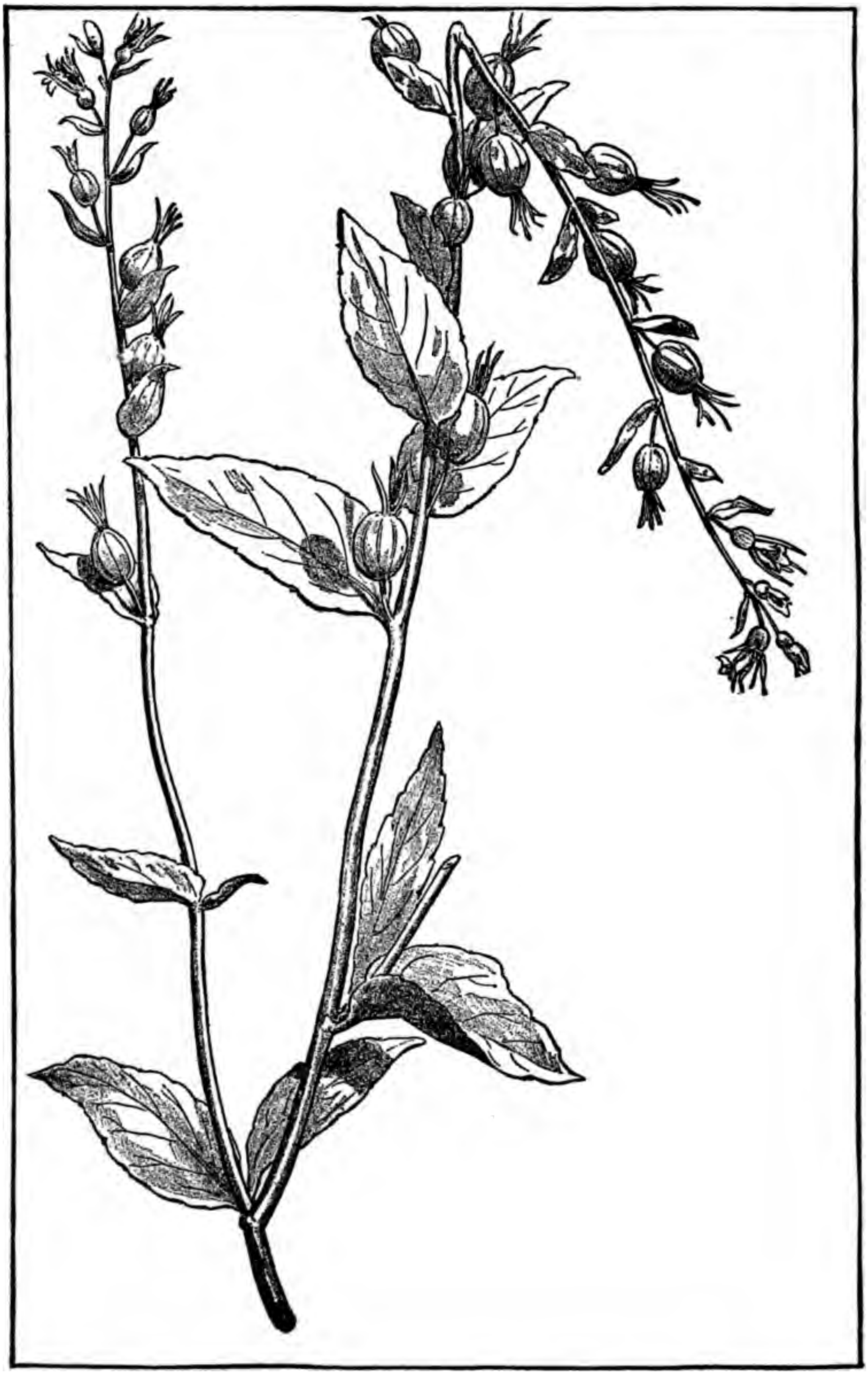
1848.—Catalogue of the Medicinal Plants of New York, Lee, p. 8.

1849.—Indigenous Medicinal Plants of South Carolina, Porcher, (Report of the American Medical Association), p. 697.

1850.—Medicinal Plants of the United States, Clapp, (Report of the American Medical Association), p. 728.

1852.—The Eclectic Dispensatory, King & Newton, p. 325.

PLATE XXXIV.



LOBELIA INFLATA.

(NATURAL SIZE.)

LOBELIA

INDIAN TOBACCO.

Parts Used.—The dried flowering plant and the seeds of Lobelia inflata, *Linnæus.*

Natural Order Campanulaceæ, Tribe Lobelieæ.

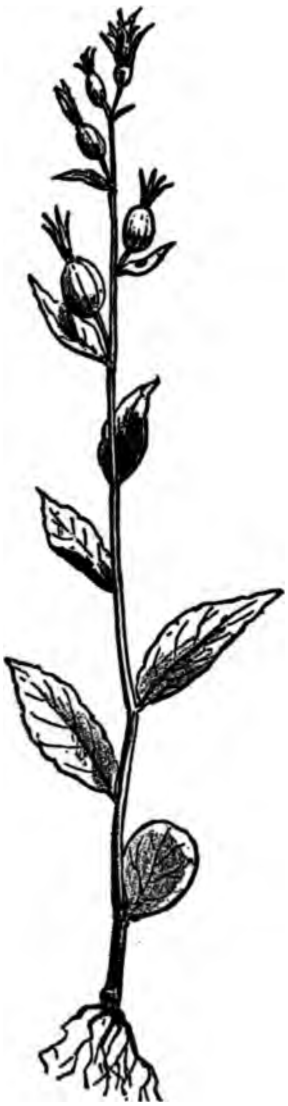


FIG. 126.
A small flowering plant of Lobelia inflata. (natural size.)

Botanical Description.—Lobelia is an annual herb growing in dry fields and pasture grounds and woodland pastures. In dry sunny places it attains a height of a few inches to a foot or two, the usual height in pasture lands being about a foot. In shady, rich soil, however, it is more luxuriant, growing two or three feet and becoming more slender and fewer branched The plant flowers in August continuing until frost into September. When the time to flower arrives, each plant begins to bloom, no matter what its height or size. Often plants will be found in bloom only an inch or two high, and only bearing three or four small leaves and as many terminal flowers. Our figure 126 represents such a plant.

The roots of Lobelia are few and fibrous. The stem is erect, green, round, striate and covered with sparse white hairs, that are beautiful objects under a microscope. Each stem that attains the usual size is branched about the middle with several ascending branches, axillary from the leaves, and ending each in a spike of flowers The branches are always much shorter than the main stem

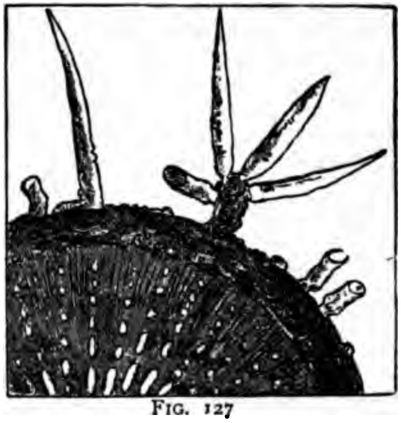


FIG. 127
Magnified portion of the stem showing branched hairs.

The leaves are alternate, mostly sessile, or the lower short stalked, and slightly decurrent down the stem, they are obovate or oblong, usually an inch to two long and half as wide, varying smaller till they merge on the upper part of the stem into flower bracts they are of a light green color, downy on both sides and soft to the touch. The veins are numerous, projecting below the leaf and impressed in the upper side of it. The margin is erosely blunt-toothed, the teeth tipped with small glandular white tips.

The flowers appear in August, the first to open axillary to the upper leaves which become successively smaller, passing into the bracts of a terminal raceme. The flowers themselves are rather inconspicuous being only about a quarter of an inch long. They are bourne on short, erect peduncles about the length of the calyx lobes.

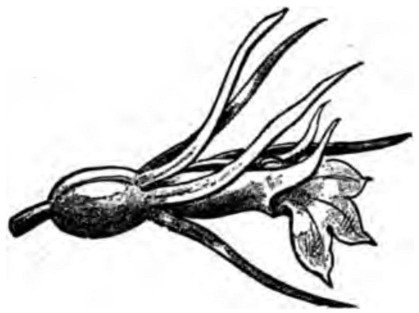


FIG. 128.
A flower of Lobelia inflata, (enlarged.)

The calyx is adherent, with a globular ribbed tube and five slender, linear, subequal, erect teeth, which are nearly as long as the corolla. The corolla is small, bilabiate, and of a light blue color; the tube of the coralla is split the entire length on the upper side, a characteristic of all the species of Lobelia, the upper lip consists of two erect, narrow lobes, the lower of three sub-equal, broad reflexed segments The stamens are five and cohering together, both filament and anther, around the pistil, form a column the length of the corolla tube and slightly projecting from the split in this tube. The pistil consists of a two-celled, inferior ovary, containing numerous minute ovules attached to the large central spongy placentas, and completely filling the ovary when in flower. The style is enclosed in the tube formed by the stamens, and ends in a small two-lobed stigma.

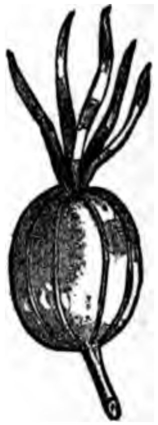


FIG. 129.
A fruit-pod of Lobelia inflata, (slightly enlarged.)

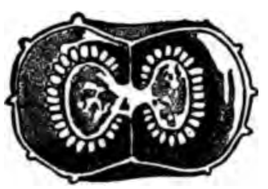


FIG. 130.
Transverse section of a pod of Lobelia inflata.

The fruit-pod is a peculiar shape, as shown in our figure 129. It is about a quarter of an inch long, inflated, sub-globular, compressed laterally, and unequal at the base, the cell opposite the stem being longer at the base than the inside cell. This is characteristic of the fruit.* The pod is prominently ten veined lengthwise with numerous, intermediate, net veins. It is crowned with the five persistent linear calyx segments, which on the unripe pods are nearly erect and slightly more than half the length of the pod; the sides are very thin and easily compressed. The pod is very much inflated, (whence the name of the plant,) and is divided lengthwise into two cells by a thin partition; it contains an axial two-lobed, comparatively large, spongy placenta, which is densely covered with the numerous minute seeds. The description and illustration of the seeds are given in our description of the drug.

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*Bentley & Trimen's illustration of the pod (fig. 6, plate 162, also of the pods on the stem) is inaccurate, as it represents the pod equal at the base, and large at the apex tapering to the base, (club shape,) which is not the case.

COMMON NAMES.—The drug is now known to the drug trade as Lobelia or Indian Tobacco.

A number of names have been applied to the plant, mostly in old works. The earliest botanists did not use a common name for it. Aiton, (1810,) calls it Bladder Pod, and this name with Inflated Lobelia and Bladder Pod Lobelia, are the natural translations of the specific name, hence, the ones used at first by botanists.

From its taste which resembles tobacco the plant began to be known as Wild Tobacco to the people, and this name was used in Eaton's first Manual of Botany, and carried through all the successive editions. From Wild Tobacco it is quite natural that it should acquire the name Indian Tobacco, as it would be presumed a tobacco that was wild would be used by the Indians. As a matter of fact, however, we have no record that the Indians ever made use of the plant in the manner of a tobacco. Dr. Carver, who spent a greater part of his life among Indian tribes, and, who wrote a list of the various economic plants used by them, does not mention the plant. Indian tobacco began to be applied about 1814, (Biglow,) but did not come into general use, outside of medicine, until adopted in the botanical class books; first, by Beck, 1833; then Wood, 1845, and Gray, 1848. At the present time it is the only common name applied to the plant, either in medicine or botany.

On the introduction of the plant to medicine a new series of common names, denoting its properties were originated.

Thomson and Cutler, who first brought the plant to general attention, called it Emetic weed, and from this name Puke weed, Vomit weed, and Gag root, have been suggested and used.

We find the name Asthma weed applied by a few writers, and in very old works, Eye-bright. In our article on the medical history will be found further remarks in connection with this subject.

BOTANICAL HISTORY.—GENERIC.—The genus Lobelia is a very large family of plants, distributed mostly in tropical and sub-tropical countries, and a few found in temperate and even frigid zones.

They are characterized by a uniformity in the structure of the flowers and fruit, but differ widely in general habits, which has given rise to a number of sections, considered distinct genera by various authors.

Plants of this genus have all milky juice, a five-lobed calyx, an irregular two-lipped corolla with the tube slit along the upper side, and five anthers united around the style. To a mere novice in botany, plants of this family can be recognized by the very peculiar split corolla and the united stamens.

The position of the genus in the natural system is obviously near the great family Compositæ, and has so been placed in all systems of classification. The genus agrees with the family in the trifid style, the anthers united around the stigma and the adherent ovary; with the tribe Cichoraceæ in having milky juice and the corolla split, the segments cohering together in one piece; with the tribe Mutisiaceæ in having labiate flowers:[*] it differs in having the flowers not collected in an involucrate head, which at first makes them appear very different, and in the character of the ovary.

The genus Lobelia has always been considered a type of a natural order, Lobeliaceæ, established by Jussieu, 1811,[†] and maintained by Endlicher, De Candolle, and most systematists, including all writers on American botany, even Dr Gray in his very recent work, 1878.[‡] By Bentham and Hooker, however, 1876,[§] these plants are included as a tribe Lobelieæ, of the natural order Campanulaceæ and we have followed these authors to give uniformity to our work, theirs being the last general work on plant classification that has been published.[‖]

In old times plants of this genus were described in common with widely different ones under the family name of Rapunculus. It was Tournefort, who first clearly defined the genus in 1719,[¶] giving it the name Rapuntium and as his genus is very natural and most of the species are still retained, it is unfortunate that the name has been replaced. The history of the present name of Lobelia is as follows: In 1703 Charles Plumier[**] in his work on plants of the West Indies,[††] dedicated to his friend Matthias de Lobel,[‡‡] a genus founded on a plant collected in the West Indies. Linnæus referred this plant to Tournefort's genus, Rapuntium, and adopted the name Lobelia for the genus, probably because it was the prior name Afterwards, when his attention was directed to the fact, that under the name Lobelia, a large number of plants were included entirely distinct from the original plant described by Plumier, Linnæus deemed it best to retain the name for the plants to which it had become most generally known and to originate a new name for the genus of Plumier.[§§]

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[*] It is a fact, not generally known to our botanists, because their attention is not directed to it by any common native plants, that a large section of the Compositæ, consisting of over fifty genera of South American and African plants, are chiefly characterized by having bilabiate corollas. We have in our Southern States a single species (Chaptalia tomentosa, *Vent*,) that belongs to this section.

[†] Memoire sur les Lobeliacées et les Stylidiées, nouvelles familles des plantes, A. L. de Jussieu, Annals des Sciences Naturales, Paris, vol. xviii, 1811

[‡] Synoptical Flora of North America, Asa Gray, New York, 1878, vol. ii., part 1, page 2.

Dr. Gray says on this subject "Too near the Campanulaceæ and nearly passing into them, therefore united by recent authors; but as there are two dozen genera, agreeing in the indefinite inflorescence, irregular corolla and mostly in the syngenesious anthers, it seems best to retain the order."

[§] Genera Plantarum, Bentham and Hooker, vol. ii., (part 2, 1876,) p. 551.

[‖] We will state in this connection that we think the family a perfectly natural one, and distinct from the Campanulaceæ. Indeed, any one will have more trouble in finding points of resemblance than points of difference between the two sections.

While we would like to follow all American authority, the Pharmacopœia, all our medical works and our own views in considering the family distinct still, we think it better to adopt the classification of Bentham and Hooker, acknowledging them as the present botanical authority on the classification of the plants of the world.

[¶] Institutiones Rei Herbariæ, J, P. Tournefort, Paris, 1719, p. 163, plate 51

[**] See note *, p. 21. Plumier was the first to honor living persons by introducing their name into scientific nomenclature. The plan met with much opposition at first because it was liable to be abused, and names of persons selected, who's scientific labors do not entitle them to this distinction It has been adopted by many of the most eminent botanists

[††] Nova Plantarum Americanarum Genera, P. Carolo Plumier, Paris, 1703, p. 21 and plate 31

[‡‡] Matthias de Lobel (Matthias de l'Obel as the name is originally spelled) should be classed among the early English botanists. He was born in 1538 at Lisle in the north of France and was educated at Montpelier in the south of France, and traveled over Italy, France, Germany, finally settling near London. By profession he was a physician, and at one time he was physician to William, Prince of Orange. His chief reputation, however, is as a botanist, this study seeming to occupy most of his time. In 1570 he published at London a small work entitled "Stirpium Adversaria" which professed to investigate the botany and materia medica of the ancients, especially of Dioscorides

A second edition of this work in 1605 contained an addition on new remedies, rare plants, etc., and in this work the first glimpse of a natural system of classification can be seen. It was necessarily very crude and imperfect, and consisted merely in grouping together such plants as seemed to accord in appearances or habits, without however defining the groups, or making any allusion whatever to the system. Some of the groups such as leguminous, grasses, etc., are quite natural and have continued to the present day, others, as could be expected, are very incongruous.

The work was printed in Latin and on this account was little known to the common people.

For the times in which he lived, Lobel was a most learned man in botany and the leader in this science. He styled himself (on one of his title pages) "botanist to king James I.," which has no doubt been the source of the erroneous statement published in several encyclopœdias that he was "physician to king James I"

Lobel died in 1616, aged 78 years.

[§§] This genus is Scævola, established by Linnæus, and referred to the natural order Goodenovieæ. The genus has a cleft corolla tube, similar to Lobelia, which no doubt led Linnæus to originally place them together, but the

BOTANICAL HISTORY.—SPECIFIC.—The original collector of Lobelia inflata is not known, but it was evidently sent to Europe early in the last century. The first authentic mention we can find of it is by Linnæus (1737)[*] in his catalogue of the plants in the garden of George Clifford,[†] hence, it was evidently in cultivation at that time. It is probable that Tournefort also refers to this plant, (1719,)[‡] but we can not say with certainty.

Previous to the appearance of Linnæus'[§] "Species Plantarum" (1753,) the plant was specified by a number of descriptive adjectives.[‖] Linnæus named it Lobelia inflata from the inflated seed-pods which name it has retained to the present day with the single synonym of Rapuntium inflatum given to it by Miller, but used by no one else.

DESCRIPTION OF THE DRUG.—In commerce two products of the plant are found, the entire dried herb and the dried seed. The former only is officinal, but the seed is a distinct article of trade, and very largely used.[¶]

Lobelia Herb.—As found in commerce this drug consists of the stems, leaves, and inflated capsules of Lobelia inflata. Usually the plant is gathered after the lower leaves have changed to brown and often the seeds have fallen from the lower capsules, which are then also brown. The plant is cut off just above the ground and the lower portion of the stem is generally devoid of leaves even in the carefully selected recent drug. Sometimes the plant has been known to appear so abundantly over an old field as to permit of its being mown with a scythe,[**] then the drug consists of straight, few branched stalks, from six to twenty-four inches long. If culled from moist situations along the banks of streams, the plants are more robust, branched and bushy.

Farmers often gather little lots of lobelia and then the entire plant is sold. Root and herb collectors on the contrary understand that the seed commands a

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fruit is very different, being in Scævola a fleshy drupe containing a single large seed. Plumier's plate shows quite plainly the nature of the fruit which would exclude his plant from the present genus Lobelia.

In thus transferring a generic name from the original species to which it was given, to a family to which it had become attached we find an analagous case in the name Magnolia. (See note,† page 21.)

[*] Lobelia caule erecto brachiato, foliis ovato-lanceolatis obsolete incisis, capsulis inflatis.—Linnæus, Hortus Cliffortianus, 1737, page 500.

It is not stated whether the plant was growing in Clifford's garden at that time, or whether it was merely preserved in his herbarium, as the Hortus Cliffortianus describes both plants of his garden and dried collection.

[†] George Clifford was a wealthy banker, who resided in Amsterdam in Holland at the time of Linnæus. He was not a close student of natural science, but having a liking in this direction and abundance of means he established an extensive private garden, obtaining the most rare and expensive exotics.

Becoming acquainted with Linnæus, who was at that time in straitened circumstances, and recognizing his talents, Clifford employed him to study and superintend his garden, giving him a liberal salary.

For the first time in his life, Linnæus had now leisure and means to pursue his studies, unembarrassed with the necessity of struggling for a living and the result was the great systematic works that have made his name famous.

For three years Linnæus remained at Amsterdam and published the Hortus Cliffortianus, a magnificent work, enumerating all the plants that were in the garden or collection of his patron. Some idea of the wealth and liberality of George Clifford may be obtained from the fact that this expensive work, of over 500 folio pages and numerous plates, was only distributed gratuitously to his friends and correspondents.

A genus of shrubs, Cliffortia, of the Cape of Good Hope, commemorates his name.

[‡] "Rapuntium Americanum, Virgæ aureæ foliis, parvo flore subceruleo."—Tournefort, Institutiones Rei Herbariæ, Paris, 1719, p. 163.

[§] Species Plantarum, 1st edition, 1753 page 931.

[‖] Lobelia caule erecto, foliis ovatis subserratis, pedunculo longioribus, capsulis inflata.—Linnæus, Hortus Upsaliensis, 1748, p. 276.

See also note * above.

[¶] The powdered herb was known to Thomsonians as *green* lobelia. The powdered seed as *brown* lobelia.

[**] Prof. A. J. Howe relates to us an instance in which several tons were cut at one time from an old wheat field about a mile from Worcester, Mass., on the road to New Worcester.

better price than the herb, and they thresh out the seed, break or chop up the stalk, and sell the seed separately. Thus it happens that the larger part of the lobelia herb of commerce is devoid of seeds, and is in a broken condition. As a rule, the leaves and capsules are of a green color, the upper capsules being especially verdant.

No substitution for Lobelia inflata herb or adulterant is gathered, of which we are aware, nor is any probable. Lobelia cardinalis and Lobelia syphilitica are such different appearing plants they would be easily detected, and the other native and more closely allied species are so small and mostly rare that it would not be profitable to collect them.

According to the Pharmacographia the drug used in England is mostly imported packed in ounces.[*]

Some writers assert that the root of Lobelia inflata is employed. This is a mistake, and first made by confusing Lobelia syphilitica with this plant. The root of Lobelia syphilitica was employed before Lobelia inflata was known to medicine, but the root of Lobelia inflata has never been used.

All parts of Lobelia inflata contain an acrid alkaloid (see Constituents, page 73,) which produces a painful irritation upon inhaling the dust of any portion of the plant. All parts of the herb, and the seed, produce an acrid biting sensation on the tongue, and a sharp tobacco-like impression in the throat and fauces. The milky juice of the green plant is intensely acrid, owing perhaps to the more soluble condition of the alkaloid. This juice is so violent that an amount so small as to refuse to affect a balance sensible to the one-thousandth part of a grain, produces a sharp tingling sensation upon the tip of the tongue. Upon drying, this juice becomes very much modified, but not by the escape of a volatile alkaloid.

The first published description of Lobelia inflata[†] states that the leaves if chewed "produce giddiness and pain of the head, with a trembling agitation of the whole body," and this sentence with little variation has passed through a multitude of works on materia medica.[‡] It has not been our experience to note a giddiness of the head, the sensation with us is simply a tobacco-like irritation until nausea, headache and vomiting occur, and this is the report of others, who we know to be familiar with the drug.

Lobelia Seed.—This drug presents a deep brown color in mass. It consists of minute, almost microscopic seed. Their actual size is about 1-60 of an inch in length by 1-240 of an inch in diameter. The typical seed is oblong, rounding at the ends, and cylindrical. Sometimes they are nearly round, however.

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[*] "The herb found in commerce is in the form of rectangular cakes, 1 to 1¾ inches thick, consisting of the yellowish green chopped herb, compressed as it would seem while still moist, and afterwards neatly trimmed. The cakes arrive wrapped in paper, sealed up and bearing the label of some American druggist or herb-grower."—Pharmacographia, 1879, p. 399.

[†] Account of Indigenous Vegetables.—Cutler, 1785.

[‡] The original description of a drug seems to be authority with many writers who neglect to give proper credit to the real author, and, who seem not to display much personal knowledge of the subject.

The average number of seeds in a capsule is between 450 and 500. It requires 2500 seed to make one grain in weight.* Upon microscopic examination, each seed is shown to be a beautiful object, bright and glistening, the surface being a corrugated ridge-like network, of which figure 131 is a representation.

Lobelia seeds are odorless, but upon handling them a fine dust rises that is very irritating when inhaled. They possess the acridity of the plant in an intensified degree, and were considered by the Thomsonians to possess one-half more strength (emetic) than the powdered leaves.

Lobelia seed have never been officinal, but are in good demand in the American drug market, and, extensively employed by Eclectic physicians who consider that the preparations of the seed are more uniform and reliable than those of the herb. Our experience is to the same effect.

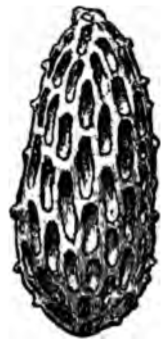

FIG. 131.
Seed of Lobelia inflata.
(Magnified.)

No adulterations or sophistications are known to us, although often fragments of the leaves and capsules are present, not being separated by sifting through fine enough seives. The commercial term for the drug free from this chaff is "clean lobelia seed."

The corrugated surface of the seed is a characteristic of the species of Lobelia, and would serve to individualize them. It would be possible to substitute the seed of other species, Lobelia syphilitica, and perhaps Lobelia cardinalis. We made a careful comparison under a microscope of the seed of Lobelia syphilitica and Lobelia inflata and were unable to note any difference either of size or marking.

We are not aware that the substitution is ever made by collectors, but it could be done with profit to them as the Lobelia syphilitica produces seed in abundance and is a common plant and easily collected.

Fortunately, however, the plants are so different in all appearances that ignorant collectors have no idea that they are at all similar and the substitution is not suggested to them

MICROSCOPIC STRUCTURE OF LOBELIA INFLATA.—(Written for this publication by Robt C Heflebower, M. D.)—Transverse and longitudinal sections of the stem of the plant show first the epidermis. (See fig. 132, plate xxxv. and fig. 136 following page.) This consists of a single layer of cells, and supports the hairs found upon the surface of the stem. Beneath this layer are several other layers of cells, (*a.* figures 132 and 136,) mostly oval upon transverse, and elongated upon longitudinal section. The cells of this layer are not all closely approximated, but there is a small space existing between some of them, whilst others are intimately joined The latter is usually the case.

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*Thus, a pound will contain 17,500,000 seed. The business firm with which the writers are connected, purchased recently in one lot 2000 pounds of lobelia seed. By our calculation this amount contains the enormous number of 35,000,000,000 individual seed

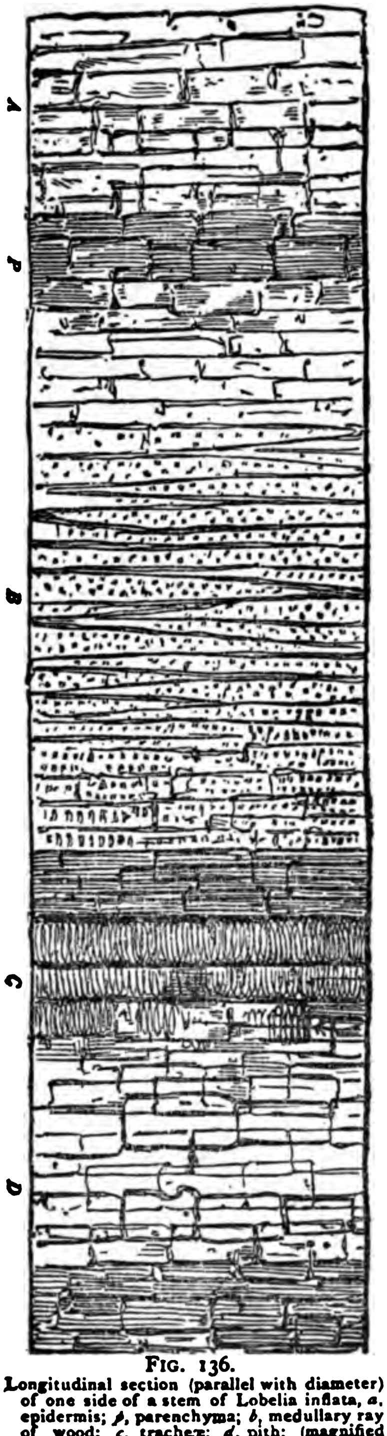

FIG. 136.
Longitudinal section (parallel with diameter) of one side of a stem of Lobelia inflata, *a*, epidermis; *p*, parenchyma; *b*, medullary ray of wood; *c*, tracheæ; *d*, pith; (magnified 300 diameters.)

Lying to the inner side of these outermost strata is the parenchyma of this portion, (*p* figures 132 and 136.) It consists of numerous cells, elliptical in outline, arranged in from five to seven layers around the entire stem In many places these cells appear irregular in form, this irregularity being caused by pressure from adjoining cells

The woody structure of the plant (*b* figures 132 and 136) is comparatively thick, and forms distinct medullary rays and interspaces

Towards the pith, at the center of the stem, are the different vessels of the plant, the lactiferous tubes (*c*. figures 132 and 136) and the tracheæ. The structure at this portion is complicated, but the tracheæ are easily seen. They consist chiefly of spiral and annular vessels, the markings of which are very beautiful. Some pitting of the cell walls is also present The lactiferous tubes are of the articulated variety, and by means of branches extending from one longitudinal tube to another, form a reticulated anastomosis.

The pith, (*d*. figures 132 and 136,) situated at the center of the stem, consists of a mass of loosely arranged cellular tissue, formed of numerous elongated cells, which, by transverse section, give an oval, a polygonal or a round outline

There are also other epidermal structures besides those already mentioned These are the hairs found upon both the stem and the leaf, the stomata of the leaf and the arrangement of the epidermal cells around such hairs and stomata.

The hairs upon the stem are simple and compound The simple hairs project directly from the epidermis of the stem, and are unicellular of an elongated conical shape, having a base or attached portion, and an apex or free portion. The compound hairs (see fig. 127, page 63) arise by a single trunk, from which project several branches. These branches resemble the simple hairs.

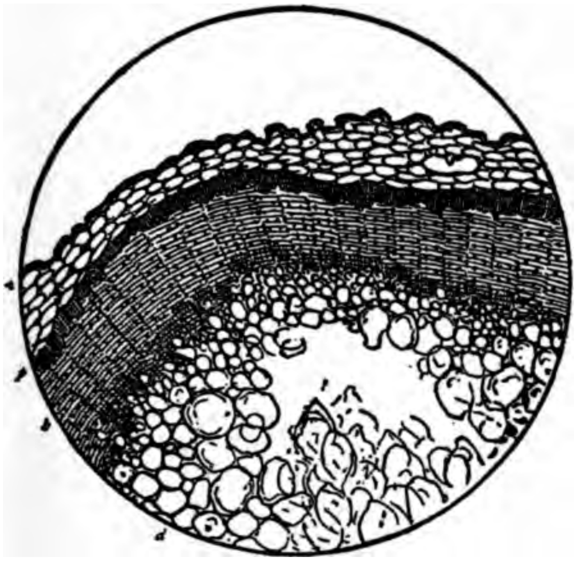

FIG. 132.

Transverse section of the stem of Lobelia inflata.—*a*, epidermis; *p*. parenchyma; *b*, woody portion, containing medullary rays; *c*, tracheæ and lactiferous tubes; *d*, pith. (Magnified 108 diameters.)

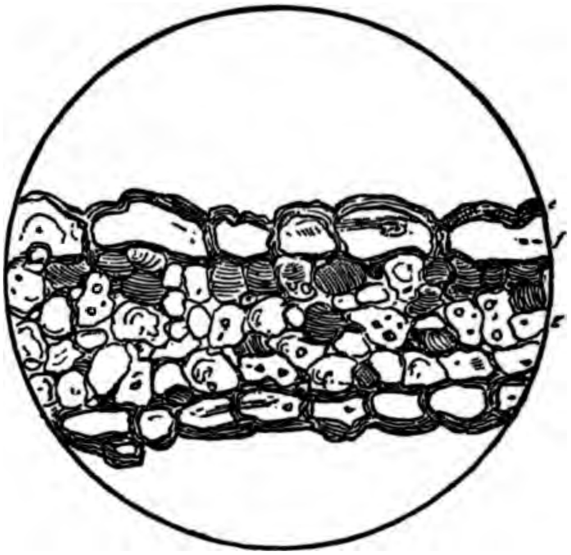

FIG. 135.

Transverse section of a leaf of Lobelia inflata:—*e*, cuticle; *f*, epidermal cells; *g*, parenchyma. (Magnified 300 diameters.)

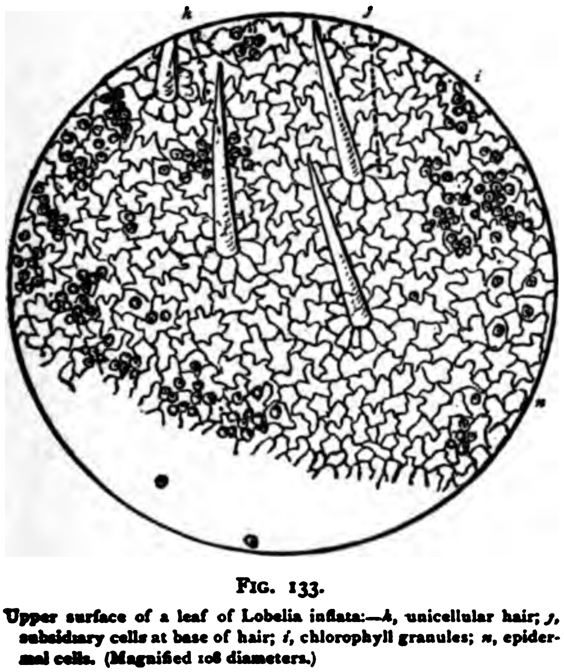

FIG. 133.

Upper surface of a leaf of Lobelia inflata:—*h*, unicellular hair; *j*, subsidiary cells at base of hair; *i*, chlorophyll granules; *n*, epidermal cells. (Magnified 108 diameters.)

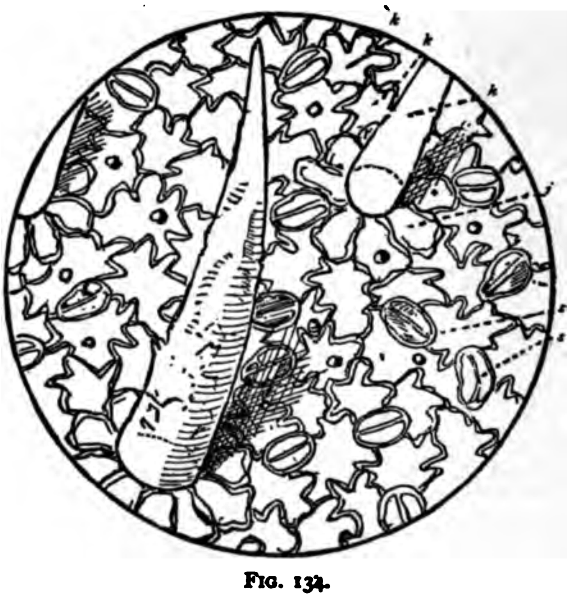

FIG. 134.

Lower surface of a leaf of Lobelia inflata:—*k*, epidermal cells; *s*, stomata; *h*, hair; *j*, subsidiary cells at base of hair. (Magnified 300 diameters.)

MICROSCOPIC DRAWING OF LOBELIA.

The epidermes of both surfaces of the leaf present cells bounded by irregular outlines and hair structures. The cells of the upper surface (see figure 133) are larger, and their walls thicker, than those of the under surface. The same is also true of the hairs of this surface.* The under surface (see fig. 134) presents in connection with the simple epidermal hairs and cells, numerous stomata, (see *s.* fig. 134.) Each stoma is widely elliptical in shape, and consists of a pore or longitudinal slit, and the guard or stomatal cells which bound the pore. Outside of the guard cells are several epidermal cells surrounding the stoma, the subsidiary cells of the stoma. The base of the hair is likewise surrounded by a similar cluster of cells, the subsidiary cells of the hair.

A transverse section of a leaf of Lobelia inflata (see fig. 135) presents the epidermis of each surface beneath the cuticle, and the parenchymatous structure between the two epidermal layers. The cells of the parenchyma are filled to a greater or less extent by chlorophyll granules.

The pollen grains are ovoidal in form and resemble a wheat grain, having a longitudinal slit on one side dividing the grain into lateral halves.

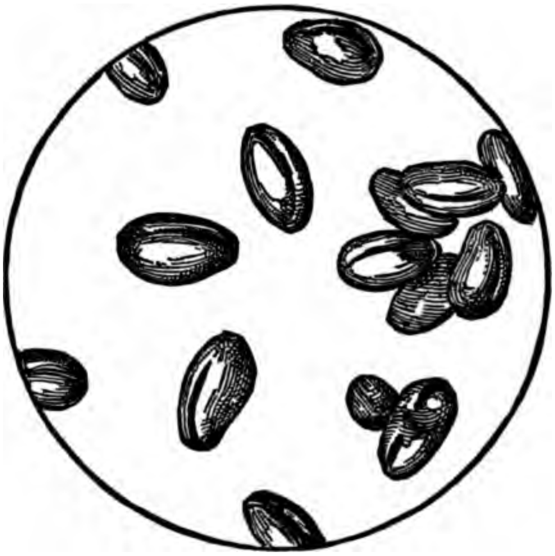

FIG. 137.

Pollen of Lobelia inflata, (magnified 650 diameters.)

CONSTITUENTS.—*Lobeline.*—The characteristic principle of Lobelia inflata is an acrid, irritating alkaloid, that pervades all parts of the plant; most easily obtained from the seed. It is known as lobeline.

It exists in combination with an unimportant vegetable acid. If freed while in contact with other constituents of the plant the alkaloid decomposes in a short time. If heat is applied to an aqueous solution of the natural constituents, this decomposition occurs rapidly and the alkaloid soon disappears.† Heat applied even to an alcoholic tincture accomplishes the rapid destruction of the alkaloid.

In a recent experiment whereby we evaporated in a close still the alcoholic tincture of fifty pounds of Lobelia seed, and extracted the residue with acidulated water, having neglected to add the acid to the alcohol, most of the lobeline perished. In another experiment, by an oversight, heat was applied to an aqueous solution of the alkaloid, while it was associated with other constituents of the plant and the alkaloid entirely disappeared.[*]

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*The apparent contradiction to this statement of our figures, number 133 and 134, is from the latter being more highly magnified.

†This fact was well known to the Thomsonians. They used but little heat, and throughout their literature we find constant reference to the loss of strength by boiling. Indeed, they wisely prefered to give both the herb and seed *in substance*. Empiricism. demonstrated what chemistry supports.

History of Lobeline.—Prof. S. Cohoun, 1834,[†] made the first examination of Lobelia inflata. He obtained by means of acidulated alcohol, a colored liquid that he took to be the characteristic principle, which however was simply a crude extract containing a salt of the alkaloid. He described it as follows: "The active principle of this plant is a brown, molasses-like fluid."

Prof. Wm. Procter, jr., 1838,[‡] made Lobelia inflata the subject of his thesis. This was the first creditable chemical investigation of the plant. By a number of experiments he fairly demonstrated the presence of a volatile oil destitute of acrimony (exp. 4,) an alkaline body, soluble in ether, (exp. 10 and 11,)[§] which is capable of forming salts with acids, (exp. 12.)[‖]

Again, 1841,[¶] Prof. Procter reconsidered the subject and obtained the alkaloid lobeline as a yellow, oily liquid, but he states, "if the process of purification were repeated, there is little doubt but that the lobeline would be obtained perfectly colorless."

Reinsch, 1843,[**] obtained a substance that he called *lobeliin*, but which was not a definite body.

W. Bastick, 1851,[††] attempted to clear up the *lobeline* record, but was far from being successful, and added little if anything thereto. He obtained Mr. Procter's impure alkaloid by employing Liebig's process for making hyoscyamine.

Mayer, 1865,[‡‡] in considering the "Principal Reactions of the Medicinal Volatile Bases" records the action of lobeline, classing it with the volatile alkaloids known at that day. In our opinion lobeline is not a member of the class (volatile) he investigated.

In 1871,[§§] Enders extracted lobelia with alcohol and distilled the liquid in presence of charcoal, washed the charcoal with water and extracted it with alcohol which yielded warty tufts, slightly soluble in water, brown, acrid, and uncrystallized. Soluble in chloroform and ether. He gave it the name *Lobelacrin*, but we find it to contain the substance we designate as inflatin and a little of the alkaloid lobeline.

W. D. Richardson, 1872,[‖‖] found that upon exposure, lobeline underwent a change whereby it became insoluble in water and refused to form salts, but the nature of the alteration was undecided.

Mr. W. H. D. Lewis, 1878,[¶¶] reviewed the literature on the lobeline subject, and suggested a modification of preceeding processes, whereby he obtained lobeline of a honey-like consistence and light yellow color, but evidently impure, as it had "a somewhat aromatic odor." He decided that lobeline exists in the plant in combination with lobelic acid, and affixed to this salt the name *lobeliate of lobeline*, but, this substance, (whatever it may be,) had previously been obtained by Procter.

Dr. H. Rosen, 1886,[***] obtained lobeline by making a benzin solution from the acrid infusion, and another alkaloid as he thought by after treatment of this liquid with chloroform. He decided that the latter alkaloid presented striated prisms. His investigations were evidently performed with small quantities from which possibly he failed to separate impurities.

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[*] Here again the Thomsonians learned from experience. They used *acetic acid* to make their most stable preparations.

[†] Prof. S. Calhoun, M.D., was Professor of Materia Medica in Jefferson Medical College, Philadelphia, at the time he wrote this paper.

[‡] Am. Journ. Pharm., 1838, p. 98, illustrated.

[§] He erroneously gives to this a strong odor. The odor was due to impurities.

[‖] In 1840, (Am. Journ. Pharm., p. 280,) Prof. Procter examined Lobelia cardinalis, obtaining an impure alkaloid, of a bitter taste. It formed salts with acids.

[¶] Am. Journ. Pharm., 1841, p. 1.

[**] Pharmacographia, p. 400.

[††] Pharmaceutical Journ. and Trans., 1851, p. 270.

[‡‡] Proceedings of the American Pharmaceutical Association, 1865, p. 211.

[§§] Pharmaceutisher Central-Blatt, No. 31, July 5, 1843.

[‖‖] Inaugural Address, Am. Journ. Pharm., 1872, p. 292.

[¶¶] Pharm. Journ. and Trans., London, 1878, p. 561. Mr. Lewis was a member of the Pharmacy class of the University of Michigan at the time he wrote the paper.

[***] An Inaugural Dissertation, University of Dorpat, 1886, communicated to the Am. Journ. Pharm., 1886, p. 392. His paper was on *Lobelia nicotianæfolia*, but he states, "the same two alkaloids were also obtained from Lobelia inflata."

Résumé.—Thus it is that, although much time and attention have been given to the lobelia constituents, the result is far from satisfactory. In our opinion, the chemistry of the subject is yet obscure. We have followed the various processes and obtained the acrid alkaloid, amorphous, colorless, intensely active, one drop of its solution immediately vomiting a strong man, but we have not crystallized either the pure alkaloid or a salt of it. We obtained crystals from the impure alkaloid *lobeline*, as others had and for some time accepted that they were the corresponding salts, but further (recent) examinations enabled us to eliminate the crystalline material entirely, leaving the alkaloid as an amorphous product.[*] That we were for a while deceived is evident, that others may also have been misled is possible. For the present we shall simply call this crystalline substance *inflatin*,[†] and are led to make this introduction before referring to the preparation of lobeline.

Preparation of Lobeline.—Extract the oil from powdered lobelia seed, by means of benzine, and dry the residue. Then acidulate the dry powder with a mixture of acetic acid one part, alcohol nine parts, and pack firmly in a glass percolator. Exhaust with a menstruum made of acetic acid one part, alcohol twenty parts. Evaporate the liquid, and when cold, add water enough to make a thin syrup, and extract the alkaloid from it by means of ether, adding cautiously ammonia[‡] to slight alkaline reaction. The ethereal liquid is then to be decanted, evaporated in presence of water that has been previously acidulated with acetic acid to excess. The watery layer is cooled, separated from overlying oil, filtered, and again extracted with ether to which ammonia is again cautiously added to slight excess. This ethereal liquid will be colorless (if not so repeat the operation) and it contains the alkaloid *lobeline*. It has been supposed to contain *only* the alkaloid, but, in addition there is a volatile oil and inflatin.

If this ethereal solution is evaporated, a colorless glassy layer remains, of a strong odor, and which turns yellow and even brown upon exposure. It is partly soluble in acidulated water,[§] yielding the alkaloid, mixed with various amounts of the associated impurities. It dissolves in alcohol, ether and chloroform, but only incompletely in benzol and carbon disulphide.

If the ethereal solution is evaporated in contact with acids (excepting acetic acid) an amorphous layer usually interspersed with crystalline formations remains. These crystals we formerly took to be *salts of lobeline*, even drawing fig. 138 under the impression that it was a sulphate. If this crystalline layer be extracted with carbon disulphide,[‖] the crystals disappear[¶] and the acrid material remains. If now, the residue (a salt of lobeline) be exposed to the dry atmosphere for a few days, it becomes odorless from escape of the volatile oil. Then, it will dissolve in water, especially if slightly acid, and after filtration can be extracted colorless and as we now believe pure, by sulphuric ether in connection with a slight excess of ammonia.[**]

Properties of Lobeline.—Lobeline is alkaline in reaction, colorless, odorless, soluble in alcohol, chloroform, ether,[††] benzol, carbon disulphide, and somewhat soluble in water. We have not succeeded in crystallizing it. It is not hydroscopic (Wittstein contra.) In pure condition lobeline can be exposed to the air for days, and is probably permanent. We evaporated by exposure, a solution in water rendered strongly alkaline by ammonia,[*] which changed to yellow, showing some decomposition, but which retained all the sensible properties of the alkaloid, remaining very acrid and being a violent emetic.

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[*] We simply state that *we* were misled. The crystals that we obtained were not of lobeline, but an impurity that intimately accompanies it and crystallizes more easily under the influence of acid liquids. Our crystals compare too, with Procter's description.

[†] We dislike to affix a name to a body that is so obscure in its classification as this now is. We find also that the various forms of the word *lobelia* is entirely monopolized. Hence, we reluctantly select *inflatin* for want of a better name.

[‡] Some use magnesia, thinking that ammonia decomposes the alkaloid. Any alkali and heat will do so, but dilute ammonia in presence of ether does not alter it in appreciable amounts. Magnesia does not entirely decompose the salt (acetate) and a free alkali is necessary.

[§] It does not necessarily follow that because this body was once entirely dissolved in acidulated water, it will completely redissolve after being dried.

[‖] We think that former investigators failed to brake up this mixture by using ether and alcohol only as solvents. These liquids dissolve the entire associated products, and acid water will also do so to an extent, although pure inflatin is insoluble in water.

[¶] See inflatin, p. 76.

[**] We make no claim to originality in the method of making lobeline. Our process differs somewhat from others it is true, but, perhaps not materially. The aim is to divest the seeds of their oil, extract the alkaloid in stable condition and eliminate impurities without the application of more chemistry than is necessary.

[††] Wittstein in his Organic Constituents of Plants states that lobeline is insoluble in ether. This is a mistake.

Lobeline turns red with sulphuric acid, yellow with nitric acid and dissolves colorless in hydrochloric acid. Heated with sulphuric acid it turns black; with nitric acid evolves the usual vapors of nitric oxide, with formation of a yellow liquid; and hydrochloric acid evaporates from it unchanged.

Salts of lobeline are very soluble in water and those we have examined dissolve in alcohol and ether, but very slightly (excepting the acetate) in carbon disulphide.[†]

From moderately strong aqueous solutions of the salts of lobeline, alkali precipitates the alkaloid, white, flocculant, amorphous and odorless. This precipitate dries to a glassy layer that will powder white,[‡] but this must be cautiously performed as minute amounts of the dust excite violent irritation of the nostrils, air passages and lungs, equal to, if not more intense than veratrine.

All the alkaloidal reagents precipitate lobeline from aqueous solution of its salts.

We have as yet failed to crystallize salts of pure lobeline, but we think that such a positive alkaloid will furnish crystals under proper conditions.[§]

Lobeline and its salts are among the most powerful of emetics, and extremely small amounts of the solution of the colorless alkaloid, (one drop being placed on the tongue) *immediately* vomited those to whom we administered it. There was no unpleasant after effect (see medical properties.) In the crude condition, as former investigators have obtained it from ethereal solution (even colorless as we made it) decomposition occurs and it rapidly darkens.

Résumé.—The alkaloid lobeline has evidently been impure as heretofore described, and may not be pure as we obtain it. Others state that it is yellow and has an odor; this certainly is erroneous for we produced it colorless and odorless. Others have obtained what was considered crystalline salts; we also formerly thought this easy, but found the crystalline material to be an impurity, to which we can find no previous reference. It has never been analyzed, but, if our present line of manipulation is successful, further remarks will follow, and a combustion made by recognized authority.

Having considered the most prominent constituent of lobelia, we shall now pass to the most characteristic principle which as before stated we have for descriptive purposes designated as inflatin.

Inflatin.— This substance exists ready formed in lobelia herb and seed, and may be extracted together with the fixed oil and chlorophyll by means of carbon disulphide. Since the oil passes with the inflatin through most solvents and holds it in solution when the other solvents are evaporated, it is not feasible to separate inflatin from the extracted oil, although, we have obtained it by saponifying the oil and separating the soap.

Inflatin has certainly been obtained by the investigators who produced crude lobeline, beginning with Prof. Procter, but owing to its intimate association with that alkaloid, and with the volatile oil of the plant, and to its refusal to crystallize while associated in this manner it has been overlooked.[‖]

The glassy layer first obtained in the evaporation of lobeline from the ethereal liquid, if moistened with acid solutions will upon drying assume a partly crystalline condition. This led us

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[*] It is stated that alkalies destroy lobeline at once. This is incorrect

[†] This solvent which seems to have been overlooked by others enabled us to purify the crude lobeline as already stated and as further explained under inflatin.

[‡] This differs from statements of others, who describe it as an oily liquid.

[§] Sulphate of lobeline is quoted in commerce. We see no reason for presuming that if demanded in quantities it should not be crystallized. We also think that manufacturers who have a demand for the alkaloid should have been able to exclude the crystalline substance that we have found to accompany it.

[‖] Even if it has crystallized, the solvents formerly employed redissolve both it and the associated principles.

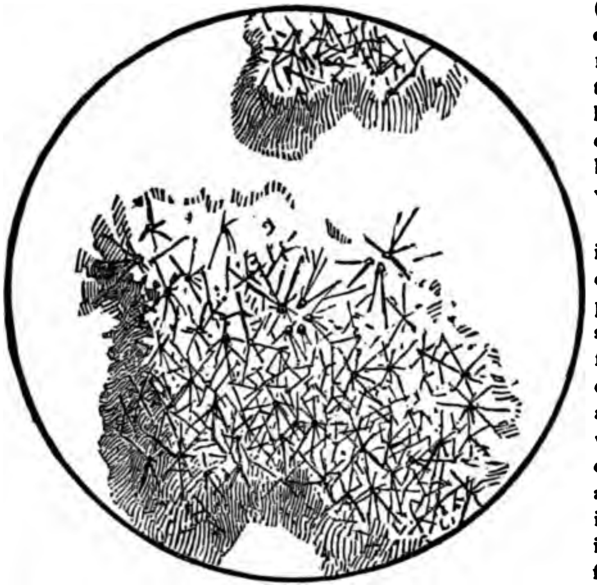

FIG. 138.

Inflatin (at first supposed to be sulphate of lobeline) crystallized from ethereal liquid.

(see page 75) to conclude that the salt of lobeline had crystallized, and figure 138, as before stated was drawn under the supposition that it was a sulphate of lobeline. These crystals with varying conditions assume different forms, and hence, we were more easily misled when we used the several acids.

Preparation of Inflatin.—Evaporate in thin layers the ethereal solution of crude lobeline (obtained by process on page 75) adding hydrochloric acid to slight excess. To the sticky product before completely dry, add a few drops of carbon disulphide,[*] and after flowing it about decant the solution into a shallow vessel. Repeat the operation with successive portions of carbon disulphide, and mix the liquids. It is best, if working small amounts, to allow the preceeding portion to evaporate each time before adding the other.

The final product will resolve itself in a few hours into small white warty aggregations, perhaps (if very impure) imbedded in a viscid, tenacious, more or less yellow semi-liquid. These globules are *inflatin*, destitute often of crystalline form because of the pressure of the surrounding medium. Occasionally an isolated globule like *a.* fig. 139 will resolve itself into a fragment like *b.* fig. 139, and we have seen these globules under the microscope become crystalline strata without change of shape.

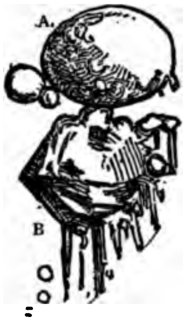

FIG. 139.
Globules of inflatin; *a*, the ordinary crude form; *b*, same, partly crystalline.

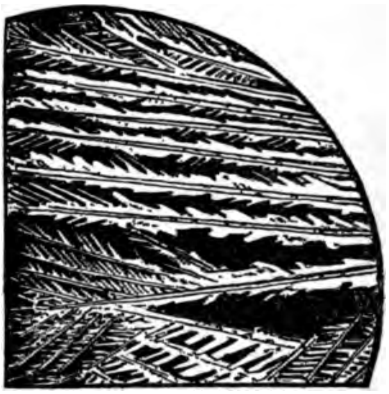

FIG. 140.
Crystals of inflatin from a thin layer of benzol solution.

Carefully drop carbon disulphide on this layer and decant it at once into a clean glass as soon as it has taken up the globules, which will be before the yellow substance dissolves. As the carbon disulphide evaporates crystalline nodules will form. The crystals do not form as distinct, however, as if the product is redissolved in pure benzol and evaporated.

Thus purified the crystals may appear like figures 140, 141, 142 and 143, dependent on the rapidity of the evaporation and depth of the liquid. Where the liquid is very thin, we observe a display like figure 140; if deep they will appear like figure 141; if deep enough to permit the typical crystal to form, they will mostly be diamond shaped[†] as shown in figure 142.

Since we have discovered the characteristics of this material, we have obtained it easily as follows: Abstract the greenish oil from powdered lobelia seed by benzine, stopping the percolation

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[*] This leaves the hydrochlorate of lobeline.

[†] The goniometer must be used to determine their exact crystalline form. They appear to us as our artist represents them.

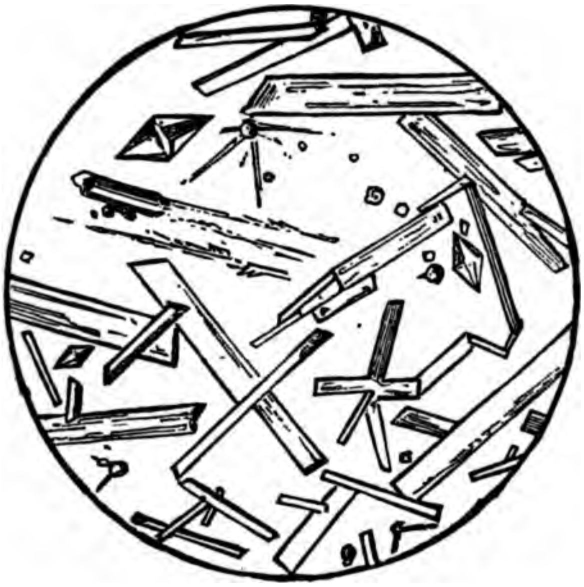

FIG. 141.
Crystals of Inflatin from benzol solution

when the percolate ceases to pass of a green color, (this abstracts much inflatin also.) Dry the magma and extract it by means of carbon disulphide. Evaporate the carbon disulphide and cool the residue. It will crystallize to a magma of inflatin and a fixed oil. Place on bibulous paper and warm it, the oil is absorbed and the inflatin can be purified by crystallization.

Properties of Inflatin.—Inflatin is pure white and from carbon disulphide tends to form nodules of a crystalline structure or in great crystalline plates. The various modifications of the crystals are shown by figures 140, 141, 142 and 143. The typical crystal is diamond shaped and perfectly transparent.

Inflatin is odorless, tasteless and refuses to unite with acids or alkalis. It is insoluble in water or glycerin, but soluble in carbon disulphide, benzol, chloroform, ether and alcohol in the order we have given. Sulphuric acid does not affect it, even the smallest crystals remaining sharp and distinct. Hot sulphuric acid decomposes it with formation of a black liquid

Cold nitric acid has no action upon it, but developes the forms and angles of a crystalline layer under the microscope in magnificent distinctness, the centers of each crystal being pure white, and the ends jet black as shown by figure 143 *a*, developed from a slide of which 143 *b* is a part without the nitric acid. Upon heating with nitric acid inflatin melts without change of color, and upon evaporation of the acid, and resolution in benzol, crystallizes as before.

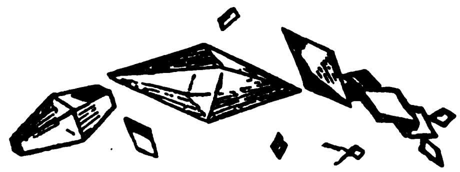

FIG. 142.
Crystal of inflatin, typical form.

Upon boiling inflatin with Fehling's solution it turns brown, then black, but does not reduce the copper and does not dissolve

Inflatin melts at 225° F., and at a lower temperature cools to a mass of crystalline structure.

Résumé.—From the preliminary examination that we have given this substance, we conclude that it is either a stearoptene or a vegetable wax, probably the former Perhaps in mechanical suspension it produces the milky juice of the plant, but we did not discover it in time to examine the juice of the herb during its season It is evidently of no medicinal importance, and, is of interest we think simply because of its association with the other constituents of lobelia

Volatile Oil of Lobelia.—Lobelianin.—All parts of the herb of fresh lobelia are pervaded by a volatile oil of a strong pungent odor, but with little taste and no acridity. It was described by Procter, (see p. 74,) 1838, who found that the tincture of lobelia, or the herb, distilled with water gave a distillate of a peculiar odor Pareira, 1840, gave it the name *Lobelianin*, and stated that it had an *acrid* taste, but, Procter, 1842, decided that he was mistaken on this point, and, our investigations support Prof Procter.*

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*We made a careful examination, distilling water from quantities of the herb, both fresh and dry, and we used the utmost care to avoid the passing over of spray with the vapor. The product gave simply (from the green herb) a volatile oil that could be separated by sulphuric ether, but it does not accumulate in amount sufficient to separate from the distillate unless the temperature be very low.

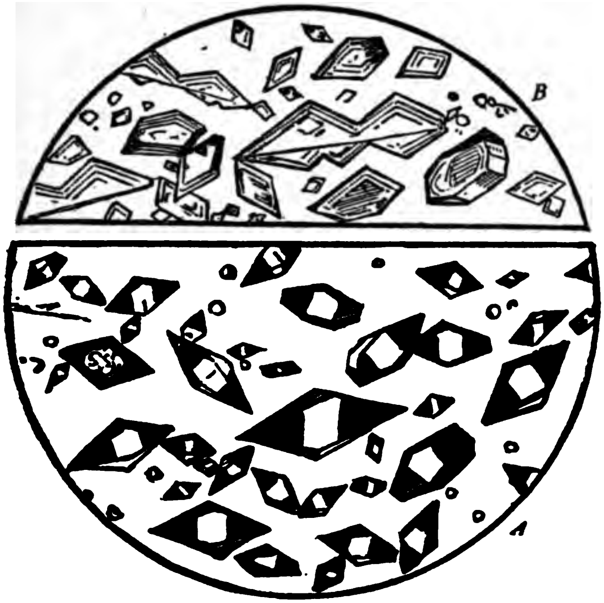

FIG. 143.
Crystals of inflatin, *b*, before; *a*, after action of nitric acid.

If a small amount of water be destilled from a large quantity of the dry herb, (Pereira and Procter used the dry.) and the destillate be reduced to about the freezing point of water, it deposits groups of transparent crystals, which do not redissolve when the water is warmed. Upon dissolving them in appropriate solvents (any of the usual solvents for volatile oils) and evaporating the menstruum, this oil crystallizes in large groups of flat, transparent plates that do not often radiate from a common center. They cover the slide and are nearly parallel connected by oblique plates, but not often in stellar groups, (see fig 144.)

Upon heating crystals of lobelianin* suspended in water it melts at a temperature of 160° F., and if melted on a glass surface it quickly evaporates without residue, evolving the pungency familiar to those who know the recent distillate. It slowly evaporates upon exposure to the air and disappears.

Sulphuric and nitric acids dissolve it and upon heating a slide of crystals to which a drop of nitric or sulphuric acids had been respectively added, the nitric acid evaporated without apparent change, while the sulphuric acid blackened and evolved empyrematic vapors. It retains its crystalline form in ammonia water and liquor potassa.

We could not determine if more than one oil is obtained by the act of distillation, but, it is probable that such is the case.

We endeavored to obtain the substance we have called *inflatin*, by oxidation of this oil, but failed, although it is apparent that some constitutional difference exists in the volatile oil of fresh lobelia and that of dry. The oil of fresh lobelia did not crystallize in our hands.

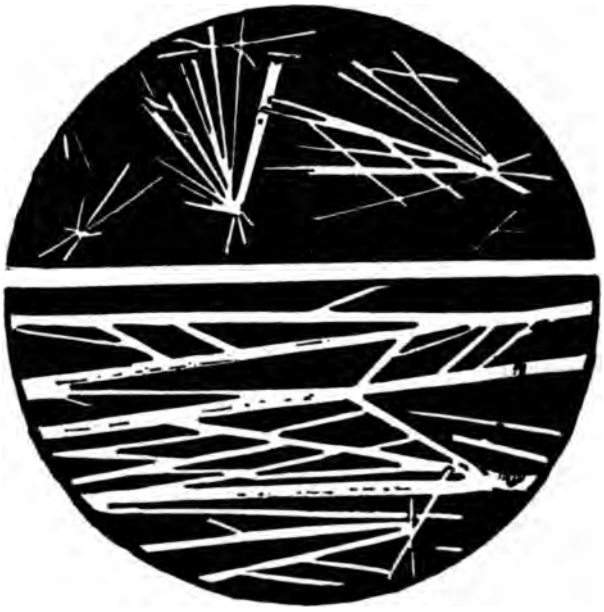

FIG. 144.
Crystals of concrete volatile oil of lobelia, from benzol solution

Has Lobelia a Volatile Alkaloid?—Prof. Procter, 1838,† found that both tincture of lobelia and the herb, with water, upon distillation gave a distillate of a peculiar odor but destitute of acrimony. Pereira, 1840,[*] stated that it had in addition an *acrid* taste, which Procter, 1842,[†] decided was a mistake. Bastick, 1851,[‡] states that "lobeline is volatile."

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*Perhaps this name is inappropriate and should not be applied to a concrete volatile oil. However, it was first given by an authority we all respect and it has precedence.

†American Journal of Pharmacy, 1838, p. 204, experiments 4, 5 and 6.

We made a careful examination, distilling water from quantities of the fresh herb. We used the utmost care to avoid the passing of undistilled liquid with the vapor, and failed to obtain either an alkaloid or an acrid distillate.[§] The product was of strong odor, from it sulphuric ether dissolved the oil, but there was no trace of acridity or of an alkaloid. Then we used dry fresh lobelia in ten pound lots, with water, and with water that was made alkaline with caustic potash. In both cases the distillate was free from acridity and refused to affect any alkaloidal reagent.

We made a solution of pure sulphate of lobeline, rendered it alkaline with caustic potash, and distilled it to one-third. The distillate gave evidence of decomposition products, but no lobeline came over.[‖]

We therefore conclude that lobelia does not contain a volatile alkaloid, and that lobeline is not volatile. There is no reason that we can see to suppose that the alkaloid lobeline is chemically related to the alkaloid nicotine. That they have been associated is probably from the unfortunate name for lobelia, Indian tobacco, and the fact that the plants and alkaloids resemble in taste, and that both are emetic.

LOBELACRIN. (SO CALLED.)—Enders, 1871,[¶] obtained a substance that he named *lobelacrin*. It was produced by exhausting lobelia with alcohol, adding charcoal and distilling. The charcoal was washed with water, treated with boiling alcohol, the alcohol evaporated and the residue extracted with chloroform Upon evaporation of the chloroform "warty tufts" of a brown color were obtained. This, Enders named *lobelacrin* Lewis considered it perhaps a *lobeliate of lobeline*. We consider it a mixture of the oil (fixed) of lobelia, the substance that we have called inflatin, a brown resin, some lobeline and coloring matter. According to our examination, it is really a mixture of such substances as are extracted from lobelia by alcohol, and having refused to dissolve in water are soluble in chloroform. It will be evident to the reader that this process certainly cannot separate the oils, wax and like bodies. That an organic acid is present is also probable.

Fixed Oil of Lobelia.—Lobelia seed contains thirty per cent. of non-volatile oily matters. The true fixed oil of lobelia is bland and non-acrid. As usually obtained, even by expression, it is acrid from contaminations. Menstruums that dissolve the oil also dissolve the chlorophyll, hence it has a green color as extracted from powdered seed. Pure fixed oil of lobelia has never been used in medicine and would be of little value.

An impure oil is a favorite with Eclectic physicians, who use it alone and associated with other substances. It is a constituent of Compound Stillingia liniment,[**] an excellent remedy, which in our opinion depends mainly upon this impure oil, which is simply a syrupy extract of lobelia seed, made with stronger alcohol acidulated with acetic acid.

Other Constituents of Lobelia.—There is a characteristic brown resin, coloring matters, and the usual constituents of plants. If the resin in alcoholic solution be precipitated by water even in presence of acid water, it carries with it a large amount of lobeline. This we thought to be a distinct alkaloid, but became assured after purification, that it was simply lobeline.[††]

COMMERCIAL HISTORY OF LOBELIA.[‡‡]—Since the day of Thomson, lobelia herb has been an important American drug. Growing abundantly in the Eastern States the first supply came from that section, but collectors in other parts subsequently gave it attention, and in domestic use and otherwise it is now a drug collected over most of the country in which it abounds. The mountainous part of North Carolina furnishes large amounts.

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[*] Elements of Materia Medica, vol. ii., 1846, p. 385, (and preceding edition.)

[†] American Journal of Pharmacy, 1842, p. 4.

[‡] Phar. Journ. and Trans., 1851, p. 270.

[§] The herb for these experiments was gathered to order and selected plant by plant There was no foreign substance present and the lobelia was prime.

[‖] The neck of the retort was plugged near the retort with a strainer of linen to retain the spray. The neck was inclined to throw the condensed liquid back into the retort. Thus only the vapor passed to the condenser. In the large still with the herb, the exit for vapor extended upward 25 feet to the condenser and a spray could not pass over

[¶] Pharmacographia, p. 400.

[**] See unofficinal pharmaceutical preparations of lobelia, to follow.

[††] Many resins have strong affinities for alkaloids and other constituents of plants. They act somewhat like animal charcoal, carrying them from solution and holding them tenaciously.

[‡‡] This article should properly follow our description of the drug, p. 67.

During its early record when Thomsonism made unexpected demands, and collectors were few, the drug occasionally became scarce, or entirely out of market. Thomson was accustomed to warn his followers of this fact and advise them to secure a supply of "No. 1,"[*] the first opportunity. He states that in 1807 an offer of one thousand dollars per pound would have failed to procure the drug, and that at another season, two dollars an ounce could not purchase it.[†] However, at present, it is plentiful and the steady demand is easily supplied.[‡]

Lobelia seed, however, often becomes exhausted and occasionally out of market. After an unusually dry season it is scarce. Two years ago it could not be collected. This year (1886) the market is glutted. The demand is small, and, few dealers care to procure more than is necessary for use in one year. Besides, the general drug trade consumes but little, the demand being almost exclusively from a limited number of specialists, who as a rule obtain their stocks from the collectors and do not depend upon the dealer in drugs.

The "Herbalists,"[§] of England, now regard lobelia with much favor, as is evidenced by their action in consequence of an endeavor, recently made by the Law and Parliament Committee of the Pharmaceutical Society, to have lobelia placed on the "English Poison Schedule."[||] They state that they use the herb freely, probably some hundreds of pounds yearly.

PHARMACOPŒIAL HISTORY.—The Pharmacopœia of the Massachusetts Medical Society, 1808, under the name *lobelia*, recognized "the root" of Lobelia syphilitica. The first edition of the U. S. Pharmacopœia, 1820, as *lobelia* introduced "the herb" of Lobelia inflata, using as a synonym the common name Indian tobacco. This was accepted by the New York, (1830,) and the Philadelphia, (1830) editions. In 1840 the term Indian tobacco was dropped and has not since been recorded, although lobelia has been officinal in each successive revision.

The fact that the Massachusetts Pharmacopœia recognized *the root* of Lobelia syphilitica, doubtless aided in perpetuating the mistake of so many medical writers who have stated that the root and top of Lobelia inflata is employed in medicine.

Every revision of the U. S. Pharmacopœia has recognized the herb of Lobelia inflata as "lobelia" and in no instance has Lobelia syphilitica been accepted or the root of any species of Lobelia recognized.

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[*] See note † page 85.

[†] Thomson's Guide and Narrative.

[‡] Thomson asserts that an abundant crop one season is followed by failure the next. We have also observed this, but, we find that it is often scarce for a series of seasons, owing to climatic influence probably, and occasionally is unusually plentiful.

[§] In the "Year Book and Transactions of the Society of United Medical Herbalists of Great Britain," 1885, we find 111 members recorded.

[||] English Poison Schedule, see note ‡ p. 88.

Pharmacopœial Preparations.—The first (1820) edition of the U. S. Pharmacopœia gave a process for making tincture of lobelia, two ounces of the herb to sixteen fluid ounces of diluted alcohol. This proportion was continued through each succeeding revision to 1880, at which time the strength was made two parts of lobelia to ten parts of tincture.

Acetum Lobeliæ, introduced in 1860, was made two parts of lobelia to diluted acetic acid, enough to produce sixteen fluid ounces, and in 1880 it was changed, one part of lobelia producing ten parts of the finished vinegar.

It will be observed that the strength of the tincture was increased about one-half in 1880, while the strength of the vinegar was decreased nearly forty per cent. We think that they should have been made identical in strength.

In 1880 the fluid extract of lobelia herb was introduced, diluted alcohol being employed in making it after the usual process for fluid extracts.

Unofficinal Pharmaceutical Preparations.—Scattered throughout medical and pharmaceutical literature we find many formulas for lobelia preparations. These preparations are still in more or less demand, and occasionally in considerable local use. We reproduce them with as little alteration as possible. The uses and doses are as we find them recorded, and in many cases would be considered inordinate at present.

Cataplasma (Poultice) of Lobelia.—Powdered lobelia herb, two ounces; powdered slippery elm, one ounce. Wet with whiskey; apply to rheumatic part.—(Sick Man's Guide, Lukens, p. 115.) This original compound was evidently followed by Prof. King in the following:

Cataplasma of Lobelia.—To equal parts by weight of powdered lobelia and elm bark add a sufficient quantity of weak lye to form a cataplasm. Used for painful swellings, inflammation of the breast, stings of insects, etc.—Am. Disp.

Enema of Lobelia.—Take of compound tincture of lobelia and capsicum, half a fluid drachm; water, half a fluid ounce; mix them together. A relaxant and antispasmodic clyster. Used in convulsions of infants.—Am. Disp.

Aqueous Extract of Lobelia inflata.—Lobelia seed, powdered, eight ounces; diluted alcohol, four pints; acetic acid, one ounce. Mix the acid and diluted alcohol and percolate the lobelia seed. Then evaporate to a soft extract. —(Prof. W. Procter,) American Journal of Pharmacy, 1842, p. 108.

Fluid Extract of Lobelia, Compound.—Blood root, skunk cabbage root, lobelia herb, of each four ounces. Make a fluid extract in the usual manner. An emetic, expectorant and antispasmodic. Used as a substitute for acetated tincture of blood root. Dose, from 10 to 60 minims.—Am. Disp.

Lotion of Lobelia, Compound.—Bayberry bark, lobelia herb, yellow dock, of each two drachms; vinegar, one pint; macerate for seven days and filter. Used for local applications in cutaneous diseases, such as erysipelas, inflammation, etc.—Am. Disp.

Liniment of Lobelia.—Stew the seeds of Lobelia inflata in animal oil. This is used to relax rigid muscles and contracted limbs by rubbing it in the skin.—Western Medical Reformer, 1837, p. 206.

Liniment of Stillingia, Compound.—Oil of stillingia, one fluid ounce; Oil of cajuput, half a fluid ounce; Oil of lobelia, two fluid drachms; alcohol, two fluid ounces; mix them together. Used in chronic asthma, croup, spasmodic diseases of the throat and lungs. Apply to the parts affected and take a few drops internally on a lump of sugar.—(Am. Disp.) The Lobelia we think is the chief constituent.—L.

Lobelia Seed with Sugar.—Powdered lobelia seed, powdered white sugar, of each four parts; rub well together and add one part of nerve powder; two parts of capsicum, and add the mixture to thirty-two parts of number six.—Thomsonian, Materia Medica, 1841, p. 699.

Syrup of Lobelia—Vinegar of Lobelia, six fluid ounces; sugar, twelve troy ounces. Dissolve by heat, skim, add a little acetic acid, and strain.—Prof. W. Procter, American Journal of Pharmacy, 1842, p. 109.

Oxymel of Lobelia.—Add one part of strained honey to two parts of sour tincture; heat to boiling point, skim and bottle.—Kost's Domestic Medicine, p. 309.

Syrup of Lobelia, Compound.—Lobelia, four parts; blood root, two parts; macerate in thirty-two parts of vinegar for one week; strain with pressure. Pleurisy root, four parts; solomon's seal, two parts; cover with boiling water and keep hot one day, adding water to produce thirty-two parts of infusion. Mix the two liquids, bring to a boil and add forty-eight parts of sugar. Relieves cough; efficient in croup; used in all cases where it is desirable to increase secretion from the air passages. An excellent diaphoretic, used in all cases of cold.—Domestic Medicine, (Scudder,) p. 230.

Syrup, Well's Vegetable.—Onions, sixteen parts; Spikenard, eight parts; Horehound, four parts; Lobelia, two parts; Pleurisy, two parts; Skunk Cabbage, two parts; Water, forty parts. Mix, boil, strain; evaporate to eight parts. Add thirty-two parts of honey; sixteen parts vinegar, and sixteen parts gin. Dose, one tablespoonful.—Improved System Botanic Medicine, 1832, p. 386.

Pills of Aloes and Lobelia, Compound.—Extract of boneset, mandrake, ginseng, of each two drachms; aloes, eight drachms; gamboge, castile soap, of each four drachms; capsicum and lobelia seed, of each one drachm; oil of cloves, two minims; make into a pill mass, and divide into four grain pills. Cathartic. Useful in dyspepsia, constipation, jaundice, etc. Dose, from two to four.—Am. Disp.

Pills, Emetic.—Extract of peach leaves, poplar or butternut bark, one ounce; capsicum, one teaspoonful; powdered lobelia seed, half an ounce; nerve powder, two teaspoonful, and a few drops of oil of peppermint. Mix and make into pills.—(Thomsonian, Materia Medica, 1841, p. 699.) (Very indefinite.—L.)

Pills of Lobelia.—Lobelia seeds, capsicum, and scullcap, each, equal amounts. Make two grain pills. Dose, one to two, every two hours. Three to five at bed time, with composition tea. Uses: coughs, hoarseness, croup, asthma, etc.—Botanic Physician, (Elisha Smith).

Powder, Expectorant.—Powdered skunk cabbage root, four ounces; powdered unicorn root, two ounces; powdered lobelia seeds, one-half ounce; mix. Dose, half to a teaspoonful.—Improved System Botanic Medicine, 1832, p. 385.

Powder of Lobelia, Compound.—Lobelia, six drachms; blood root, and skunk cabbage, of each, three drachms; ipecac, four drachms; capsicum in powder, one drachm; mix them together. Used in all cases where an emetic is indicated. It vomits easily and promptly without causing cramps or excessive prostration. Dose, half a drachm every fifteen minutes in an infusion of boneset, until two drachms have been taken, or the patient vomits.—Am. Disp.

Third Preparation.—One ounce of powdered lobelia seed; one ounce of capsicum; one tablespoonful of nerve powder; mix; add to half a pint of Number Six, (No. 6). This is Thomson's great remedy, known also as Rheumatism drops and Hot drops.

Antispasmodic Tincture.—Tincture lobelia, tincture capsicum, of each, sixteen fluidounces; tincture nervine, twelve fluid ounces. Dose, from half a teaspoonful to a tablespoonful. Used as an antispasmodic, and in large doses as an emetic.—(Improved System of Botanic Medicine, Howard, 1832, p. 379.) This is the original formula from which Prof. King devised:

Tincture of Lobelia and Capsicum, Compound. (King's Expectorant.)—Lobelia, capsicum and skunk cabbage, of each, two ounces; diluted alcohol, a sufficient quantity to make two pints of tincture by percolation. This tincture is a powerful antispasmodic and relaxant. Used in cramps, spasms, convulsions, tetanus, etc. Dose, half a teaspoonful as the case may require.—Am. Disp.

Tincture Lobelia herb.—Bruise fresh lobelia, press firmly into a jar, cover with alcohol, after a few days strain and press. To each quart add one ounce of essence of sassafras. Used as an emetic, and for external application to wounds, bruises, inflammations, ulcers, eruptions, etc. Dose, one to ten teaspoonfuls.—(Improved System Botanic Medicine, 1832, p. 384.) The original tincture of lobelia. Dose, now heroic.

Tincture Lobelia seeds.—Digest four and one-half ounces of powdered lobelia seed in a pint of alcohol.—Improved System Botanic Medicine, Howard, 1832, p. 379.

Tincture of Lobelia, Compound. (King's Expectorant.)—Lobelia, blood root, skunk cabbage, wild ginger and pleurisy root, each in moderately fine powder one part; water, sixteen parts; alcohol, forty-eight parts; make a tincture in the usual manner. An excellent remedy for children and infants. Used as an expectorant, as a nauseant in coughs, asthma and where expectorants are indicated.—Am. Disp.

Tincture of Lobelia, Ethereal.—Lobelia herb, five ounces; spirits of sulphuric ether, two pints. Make a tincture by percolation.—Edinburgh Dispensatory, 1848.

Tincture of Lobelia and Hydrastis.—Hydrastis, lobelia seed, of each, two parts; diluted alcohol, sixteen parts. Make a tincture by percolation. A valuable local application.—Am. Disp.

Tincture of Sanguinaria, Compound.—Blood root, lobelia, skunk cabbage, of each, two parts; distilled vinegar, thirty-two parts; alcohol, two parts. Make two pints of tincture by percolation. Used as an emetic and expectorant. Dose, twenty to sixty drops.—Am. Disp.

Tincture of Viburnum Opulus, Compound.—Lobelia seed, skunk cabbage, stramonium seed, capsicum, blood root, of each, one part; diluted alcohol, one hundred and twenty-eight parts. Make a tincture by percolation. Stimulant and antispasmodic. Used in asthma, hysterics and nervous diseases. Dose, twenty to sixty drops.—Am. Disp.

Well's Cough Drops.—Tincture lobelia, one ounce; anodyne drops, two ounces; antispasmodic tincture, one ounce. Dose, half to a teaspoonful.—Improved System Botanic Medicine, 1832, p, 382.

Sour (Acid) Tincture of Lobelia.—Made the same as the ordinary tincture, vinegar being used instead of the alcoholic menstruum.—(Kost's Domestic Medicine, p. 309.) This is the original of the officinal Vinegar of Lobelia.

MEDICAL HISTORY.—Several annoying features in connection with the history of this plant are considered by us, and an endeavor is made to study them in chronological order.

The first printed record of the emetic properties is by Rev. Manasseh Cutler,[*] who named it emetic weed.

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[*] Account of Indigenous Vegetables.—Am. Acad. Sciences, 1785, p. 484.

Manasseh Cutler, LL.D., was born in Killingly, Conn., May 3, 1742. First he engaged in the whaling business, then in merchandise in Edgertown; studied law and was admitted to the bar in 1767; removed to Dedham, studied theology, was licensed in 1770 and ordained minister of Hamilton, September, 1771. He became chaplain of Col. Francis' regiment, September, 1776, fought in the action in Rhode Island, and for his bravery received a present of a

Schoepf, 1787,[*] next incorrectly ascribed astringent properties to Lobelia inflata and stated that it was used in ophthalmia. He had confused the two species and affixed the properties of Lobelia inflata to Lobelia syphilitica.

Then came Samuel Thomson,[†] who introduced the plant into medicine

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fine horse. He also studied medicine and other branches of science. He became a member of the American Academy in 1781, contributing a series of scientific papers to its memoirs in 1785; his botanical paper being the first attempt at a scientific description of the plants of New England. In this paper we have the reference to the emetic properties of lobelia, which is the first printed notice of the nature of the plant, but he did not use it in medicine.

With Dr. Beck he prepared the chapter on trees in Belknap's history of New Hampshire, became a member of the Philosophical Society of Philadelphia, 1784; as agent for the Ohio Company he purchased 1,500,000 acres of land northwest of the Ohio river, 1787, and started the first emigrants to that section, who settled at Marietta, Ohio, April 7, 1788. He acompanied them in a sulky, returning to New England in 1790. Gen. Washington appointed him Judge of the Supreme Court of Ohio Territory, 1795, which honor he declined. He was member of Congress from 1800 to 1804.

In the prosecution of Samuel Thomson, 1809, Cutler was called as an expert to identify the remedies Thomson used. It was about this time that he (Cutler) became interested in the use of lobelia as a remedy for asthma, (see Thacher's Dispensatory, 1810,) and there is reason to believe that his attention was drawn to it by Thomson and his followers, as before this Thomson had used the herb in that disease and his followers were numerous throughout all of New England. Cutler died in Hamilton, Mass., July 28, 1823.

[*] Materia Medica Americana, 1787, p. 128.

[†] Samuel Thomson was born in the town of Alstead, State of New Hampshire, February 9, 1769. His early life was spent in hard labor upon a farm, and his education was limited. He commenced medical experiments when about ten years of age by vomiting his playmates with lobelia, and afterward became as is known, the champion of this herb. He married Susanna Allen, of Surrey, New Hampshire, July 7, 1790. His medical investigations commenced in the treatment of his own family, and then he began to gather roots, herbs and barks and to practice empirically in the families of his neighbors. That he also studied the medical literature of his day is evident from his publications, although he delighted in believing himself entirely independent, and was very caustic and aggressive towards the Regular Medical Profession.

In due course of time, Thomson became known outside his immediate neighborhood. Thus, in 1805, he made a professional trip to Richmond, in 1806 was called to New York City to use his "treatment" on Yellow Fever, and in 1807 to Vermont. After this he traveled considerably over the New England States, and eventually through the West in the practice of his peculiar theory.

During these trips his combative nature led him continually into heated arrangements of members of the Regular Medical Profession, who bitterly denounced his treatment, resulting finally in an open charge of murder against him in 1808, for "sweating (see note *, p. 85) two children to death," and again, in 1809 for killing a certain Captain Trickey, who Thomson declared that he had not treated at all. Finally, in 1809, a Dr. French, between whom and Thomson there had long existed an intense animosity, preferred charges, and Thomson was arrested for the wilful murder of a young man named Lovel, who had died under his attention. Dr. French charged that he "did kill and murder the said Lovel with lobelia, a deadly poison."

Thomson was thrown into prison at Newburyport, Massachussets, November 10, 1809, where he remained suffering the severe cold of that country without fire or comfort until December 10th, when he was taken to Salem, Mass., for trial, his friends having succeeded in inducing Judge Theophilus Parsons to hold a special session of the court. However, owing to sickness of the Judge, his trial did not occur until December 20th. The prosecution seemed to base their charges on the fact that the powder given Lovel was lobelia, a Dr. Howe testifying to that effect. The defense showed, however, that Howe was not acquainted with lobelia, and also that the powder Drs. Howe and French thought to be lobelia was marsh rosemary root. (Thomson asserts that this was what he administered). Finally the court acquitted Thomson, without, as he claims, an examination of his witnesses. However, Tyng's Reports, vol. vi., states that on the claim of ignorance only did the Judge instruct the jury to acquit Thomson, and our view of the treatment as shown by the report is to the effect that both lobelia and the marsh rosemary were administered.

This was the memorable "Trial of Thomson," but it did not end the assaults of his adverseries. Thomson entered suit for damages against Dr. French, March, 1810, and failed in his prosecution, loosing much time and more than six hundred dollars of costs.

In 1811 a doctor in Eastport, Me., while Thomson was passing his office door, tried to kill him with a scythe, and it seems that even Thomson now became discouraged, for he writes: "I found I had enemies on every hand, and was in danger of falling by some of them. Everything seemed to conspire against me."

In March, 1813, he obtained a *patent* to protect on his system of medicine, known thereafter as "Thomson's Patent."

We find that although Thomson was very bitter regarding the Regular Profession generally, he spoke in the highest terms of Drs. Rush and W. P. C. Barton, of Philadelphia, with whom he had several interviews.

Dr. Thomson died in Boston, Mass., 1843, after a tedious application of his own medicine, known as Thomson's Course, (see note ‡ p. 85).

We have consumed considerable space in recording the principal points in the life of an exceedingly, energetic about 1793 under a peculiar system of practice or theory,[*] in which he used classes[†] of crude drugs in a system of courses,[‡] lobelia being the first class and

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and zealous man, who boasted of his illiteracy, never attended a college, or received a lecture in medicine, but who created a lasting excitement in the medical world of America, and who still has many earnest followers under the name Thomsonians, although his methods of treatment are very much modified.

His life was marred by sufferings and quarrels. He was in a constant turmoil and fearlessly attacked his opponents, however high their positions. Defeat did not dishearten him, success nerved him to greater aggressments. Enemies arose within his camp towards his latter days and he met them as fearlessly as he did the "Regulars." We cannot, but admire the tenacity with which he adhered to his views and practice. If he had been permitted to receive a thorough education, and had been led to systematize his labors, his indomitable spirit and tenacity of purpose would have doubtless made him conspicuous among the pioneers of America, either within the medical profession or otherwise. It will yet be our duty to review Thomson's Theory in the practice of which it was claimed (1834) that thirty thousand persons were enrolled. They were then generally known as "Lobelia Doctors" "Heaters," "Steamers," and "Sweaters."

[*] Samuel Thomson believed, "that all diseases are the effect of one general cause and may be removed by one general remedy, is the foundation upon which I have erected my fabric." This is a positive statement, showing the views he held of the various disease expressions. The reader must not however, infer (as antagonists to Thomson misstated) that by the term "one general medicine" he meant a single drug. Upon the contrary, he used many drugs and he states, "all diseases might be cured by one general remedy or principle, applied in a great many forms as medicine."

Origin of Disease.—"I found that all diseases to which the human family were subject, were, however various the symptoms and different the names by which they were called, produced directly from obstructed perspiration."

Cause of Obstructed Perspiration.—"If there is a natural heat, there must be a natural perspiration." Obstructed perspiration "is always produced by cold or the absence of a suitable degree of natural vitality."

Heat is Life.—Arguing from the foregoing, Thomson announced the axiom that has since become attached to his followers: "Heat is life and cold is death." He did not perhaps mean this in a literal sense, but, he believed that a low temperature (cold) caused disease, and that fever a friend was an effect of cold. "The cold causes an obstruction and fever arises to remove it." This view is not peculiar. Perhaps, the religious of the Sun worshipers may be considered about the same. "Coffinism" of England was similar

Canker.—In all Thomsonian works the name is conspicuous. Dr. Thomson believed that a "white feverish coat" was caused by cold and attached itself to the mucous membranes of the stomach and bowels. This he called canker. "Canker and putrefaction are caused by cold. If this growth of canker is not checked and removed, it will communicate with the blood, when death will end the contest between heat and cold." Dysentery is caused by canker in the bowels. The piles is canker below the reach of medicine in the usual way. What is called bearing down pains in women is from the same cause.

Object of Medication.—According to Thomson should be to produce a great internal and external heat to prevent the formation of canker and throw it to the stomach, and then to remove it from the stomach by emetics. Astringent in Thomson's opinion, combined with this secretion (bayberry and other like bodies); stimulants promote perspiration (capsicum, steam, etc.); emetics remove the canker from the stomach.

[†] Thomson arranged his remedies into *classes* and numbered them, often individualizing a drug by making it the conspicuous member of a class Thus, Emetics made Class No 1, and lobelia being his great emetic was simply called "No. 1." He would say, 'then administer No. 1."

The classes were as follows:—Class No. 1, "Emetics, to cleanse the stomach, remove obstructions and promote perspiration," lobelia being typical.—Class No. 2, "Stimulants, to raise and retain the vital heat of the body, and promote free perspiration," capsicum being typical.—Class No. 3, "Astringents, to scour the stomach and bowels and remove the canker," bayberry and composition being typical.—Class No. 4, "Bitters, to restore digestion, and correct the morbid secretions of the blood and bile," hydrastis, populus, etc., being typical.—Class No. 5, "Restorative Tonic, compounded to correct digestion, and strengthen the stomach and bowels," wild cherry being typical.—Class No. 6, "Antiseptics, to give tone to the stomach and bowels, and prevent mortification," myrrh and a compound tincture of myrrh being his favorite. The familiar No. 6 of the present day, is modified from Thomson's formula.

The enemies of Thomson have asserted that he first administered No. 1, if that failed, used No. 2, and so on until through with the list if the patient still lived.

[‡] The following condensed accounts of the system of Thomson's Courses is taken from the American Vegetable Practice, by Mattson. In Thomson's works the directions are not so explicit as herein given, as it seems that he depended to an extent upon the personal instruction of himself or his agents.

Thomson's Course of Medicines.—1st. Give the patient a teacupful of hot bayberry tea, (No. 3,) then an injection of a cup and a half of an infusion of bayberry and a teaspoonful of lobelia. Sometimes the lobelia of this injecting fluid is increased and a teaspoonful of capsicum added.

2nd. When the injection has operated, a steam bath is to be applied to the patient and a *second* teacupful of bayberry tea. If he does not perspire freely, in ten minutes, give a *third* teacupful of tea, and add to this last a teaspoonful of capsicum. In about twenty minutes, remove the patient from the bath, and, into a warm bed (sometimes a cup of ice water was dashed over the person upon removal of sweat bath) with a hot stone to his feet.

his principal remedy. He met the opposition of most Regular physicians, who bitterly decried the indiscriminate use he made of drugs, and he eventually was arrested (1809) and tried for killing a patient with lobelia. This trial brought lobelia before the public, and from that time to the present, lobelia has been in more or less demand and has come into use by all schools of medicine. Accounts of its uses and accepted medical properties in the different schools have been written for this work by authorities of these schools.

In studying the history of the introduction of lobelia into medicine the following questions have at various times arisen and attracted more or less attention and discussion by our medical writers.

1st. *Did the North American Indians use Lobelia inflata?*—In our next article on Lobelia syphilitica it will be seen that Sir William Johnson, preceding 1800, bought a cure for syphilis from the Indians, which turned out to be the root of Lobelia syphilitica. It is asserted in most medical works that the American Indians used Lobelia inflata, but this assertion is not supported by the testimony of any writer we can find who was acquainted with the medicines employed by the Indians, and the pioneer travelers of America (Shoepf excepted, see p. 84,) failed to refer to the plant. We, therefore, conclude that these writers have confused the Lobelia syphilitica of Johnson with Lobelia inflata.

Carver, who spent many years of his life among the Indians, and described the plants, trees and medicines of the tribes among whom he traveled, does not mention it.

Lewis and Clark speak of the use of the vapor bath, but do not mention that Lobelia inflata was used by the Indians of the Upper Missouri Speaking of syphilis among the Indians they say:[*] "When once a patient is seized, the disorder ends with his life only " They state of the Chippewa Indians, (p 136.) that, "their specifics are the root of the lobelia and that of a species of sumach." It is evident that this is not from observation, as the Chippewas, (also known as the Ojibwas,) were not the Western Indians. They embraced many formidable tribes about the great lakes. Into their country Sir William Johnson extended his treaties, and his statement regarding Lobelia syphilitica, is evidently the source of the statements by Lewis and Clark.

The book of the Indians, 1837,[†] gives no instance of its use by the Indians, or of any other emetic.

The paper on "Indian Medicine."[‡] by Browne, does not refer to any substance that can be identical with lobelia.

Major Long, 1819, in his account of the medicines and practice of the Indians of the West, evidently knew nothing of Lobelia inflata.

Professor Nuttall informed Dr. Mattson that in his excursions among the Indians he had never known them to use Lobelia inflata.

3rd Add a heaping teaspoonful of powdered lobelia herb to a cupful of the capsicum and bayberry tea, give at one dose, or, infuse five teaspoonfuls of lobelia in a cup and a half of hot water and take in three doses even if each dose vomits.

4th After the vomiting ceases, a second steaming is administered, giving the patient a cup of hot ginger or composition tea while in the bath. Then if the patient "has sufficient strength" he may dress, and if not he must be put into a warm bed. This concludes the "course."

5th Bitters and tonics are then administered If the malady is not cured the course must be repeated "Miss B——, of Lynn, Mass , took twenty-seven courses for a malignant disease of the stomach." "I knew a gentleman with dropsy to whom a course was administered once a week for nine months," etc.

This severe method of treatment gave rise to the dogeral once applied to Thomsonians:—

"I puke, I purge, I sweat 'em,
And if they die, I let 'em "

[*] The Expedition to the Sources of the Missouri, Lewis & Clarke, vol ii., pp. 135 and 196.

[†] Book of the Indians. Boston, S G Drake, 1837. A very interesting and unique publication.—*L.*

[‡] Indian Medicine, J M Browne, in Indian Miscellany, p. 74 (Edited by W. W. Beach, 1877).

The interesting narratives in "Indian Captivities," contain no record of Lobelia inflata, although rich in the experiences of persons, who passed many years among the Indian tribes east of the Mississippi.

Samuel Stearns, M.D., 1772, in his American Herbal, mentions other species of lobelia, but not Lobelia inflata, and he makes no reference to the Indians using an emetic. Dr. Stearns was a native of Massachusetts and traveled among the Indians of that State with intent to study their remedies, and would not have omitted this plant if it had come under his observation. Neither Schoepf, Barton, nor Rafinesque mentions Lobelia inflata as an Indian remedy from personal experience, and none of these authors would have neglected it, if aware of its being in use.

Catlin,[*] in his explicit descriptions of Indian customs omits it.

However, Mattson, 1841,[†] states that, "There is abundant traditionary evidence that it was used by the Penobscot Indians long before the time of Dr. Samuel Thomson, its reputed discoverer, but with the exception of that tribe, I have not been able to discover by any researches I have made, that the American aborigines had any knowledge of its properties or virtues."[‡] Mattson, however, neglects to give any positive testimony, or refer to any authority.

Dr. G. A. Stockwell, in a very recent article[§] omits it, and thus helps to confirm the fact that lobelia was not used by the Indians.

Therefore, from authorities quoted, and numbers of other works searched without avail, we conclude that the evidence is altogether against the reiterated assertion that Lobelia inflata is a drug handed down to us from the American Indians. We cannot find proof of a single instance where it was employed by them. If the Penobscot Indians used the plant, as Dr. Mattson believed, (from tradition) it is possible that the adjacent settlers learned of its properties from them, but we would more rationally accept that the early use of Lobelia inflata in domestic medicine was an accidental discovery of the whites. Those were days of heroic remedies; bleeding, emetics and blisters were the methods of treatment, and it is not to be presumed that so remarkable and common an emetic as lobelia could remain unknown. That Thomson and Cutler learned of its emetic properties by independent personal experience is undeniable we think, Thomson especially insisting that he stumbled upon it.

It is a common belief with some persons that the Indians used the lobelia in connection with their "Sweat Baths" to clear their minds, and remove their ailments, but our endeavors to find the authority for such statements have resulted in failure. The "Medicine Men," it is true, pretended sometimes to vomit bones, by which the future was foretold, but, this if not a deception had no connection with the medical uses of lobelia, and there is no evidence at our command to support the supposition that the whites learned of its properties from the Indians, or that the Indians used it in medicine.

2nd. *Did Samuel Thomson discover the Properties of Lobelia indepently of others?*—Thomson asserts that,[‖] sometime in early life (1773) I discovered a plant which had a singular branch and pods. The taste and operation produced were so remarkable that I never forgot it. I afterwards used to induce other boys to chew it, merely for sport to see them vomit. I tried this herb in this way for nearly twenty years without knowing anything of its medical virtues. This plant is what I have called the *emetic herb*.[¶]

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[*] Manners, Customs and Condition of the North American Indians, Catlin, vol. i., p. 186.

[†] Mattson's American Vegetable Practice.

[‡] Thomson believed that the reference to the use of lobelia by the Indians was an intentional mistatement in order to rob him of the discovery, he writes ·

"It is said by Thacher, that it was employed by the aborigines, and by those who deal in Indian remedies; and others, who are attempting to rob me of my discovery, affect to believe the same thing; but this is founded altogether upon conjecture, for they cannot produce a single instance of its having been employed as medicine, until I made use of it. The fact is, it was a new article, wholly unknown to the medical faculty, till I introduced it into use; and the best evidence of this is, that they are now ignorant of its powers, and all the knowledge they have of it has been obtained from my practice.—Thomson's "New Guide to Health," 1822, p. 52.

[§] Popular Science Monthly, "Indian Medicine," G. A. Stockwell, M.D., Sept., 1886, p. 649.

[‖] New Guide to Health, p. 16.

[¶] Ibid, p. 27. We must not forget that this was written after the trial of Thomson, and then it seems, there was an intense feeling between Thomson and Cutler.

Thus it seems that Thomson understood the emetic nature of Lobelia inflata before 1793, but, he asserts that, "I tried this herb in this way for nearly twenty years without knowing anything of its medical virtues." He further admits this by saying, "It had never occured to me that it was of any value in medicine until about this time (1793). I have since found by twenty year's experience in which time, I have made use of it in every disease I have met with, to great advantage, that it is a discovery of the greatest importance."

Thus Thomson admits that he knew nothing of the use of lobelia in medicine preceding 1793, and the first record we have of his making use of it in asthma is in 1807, to wit: "In the fall of 1807, I introduced lobelia, tinctured in spirit, as a remedy in asthma."

Mattson, 1841,[*] states however, that "it was used as a remedy by many people in New England, long before his (Thomson's) time." He recounts as follows:[†]

"Mr. Phillip Owen, now eighty years old, relates that when a boy he was sent into the field by his mother to collect some lobelia for a child, sick with the quinsy, and that the herb, administered in the usual manner, afforded speedy and entire relief." This would show a use of it at about 1770.

"Mr. William Coburn, who also reached his eightieth year, says that lobelia has been used as a medicine in the state of Maine, both by the people, and the Penobscot Indians, ever since he can remember, which is a period of not less than seventy years." This also carries us back to 1770.

Dr. John A. Hyde, of Freeport, Maine, a very old physician states that, the people in that vicinity were in the habit of using lobelia under the name colic weed, when he first settled in the town, which was about fifty years ago. He says they employed it in various complaints, but particularly in colic, and considered it perfectly safe and harmless." This carries the use back to 1790, and antedates Thomson again.

Dr. E. Harlow, of New Lebanon, Conn., writes under date of May 15, 1835, to a gentleman in Boston: "I commenced the vegetable or botanic practice of medicine about 1796, under the instruction of Dr. Root, of Canaan, Conn., who was esteemed as an able botanic physician. He made use of lobelia under the name Indian tobacco, and taught me the use of it; and from that period to the present, I have continued to employ it in my practice. I may also state that Dr. Forbes, of Lebanon, used it when I was a boy, and from that circumstance it received the name of "Forbes weed." And lastly, "Doctress Charity Shaw Long, of Albany, N. Y., secured a patent for the use of Lobelia inflata, in 1812, which was one year in advance of Thomson's patent."

Thus from evidence that is entitled to credence it seems that lobelia was somewhat known as a domestic medicine, when Thomson was one year old, and there is little doubt that its use in household practice long antedated any positive information that can be found in print at this late day. Nevertheless, Thomson introduced it to medicine, and none will dispute that Samuel Thomson made lobelia a familiar name to hundreds of thousands of Americans; that he made it notorious none can deny. Whether the domestic uses of lobelia (by a few persons) could have served to give Thomson a start with his "Practice" is a question of little moment. He distinctly asserts that such was not the case, and that he discovered and introduced lobelia independently of all others. In our opinion his statement is entitled to credence. He was intensely enthusiastic on the lobelia subject, and when writers on medicine ignored his claims, to give credit to Cutler and Drury, he considered it an act of injustice, and he expresses himself on the subject as follows: "They cannot produce a single instance of its having been employed as a medicine till I made use of it."

This tendency to neglect him, and, as he believed to persecute him for opinions sake, finally induced Thomson to seek Government protection, both for legal and monetary considerations, resulting in "Thomson's Patent."

Is Lobelia a Poison?—A recent endeavor has been made in England to place lobelia on the "Poison Schedule",[§] and in studying the record we find that in several instances legal steps have been taken to punish persons, who, it was claimed had destroyed life by the injudicious use of this drug. The trials of Dr. Thomson[*] and Dr. Frost[†] have attracted the most attention.

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[*] The American Vegetable Practice, Mattson, vol. i.

[†] Mattson and Thomson were at first friends, but afterward were enemies. It seems to us that Mattson makes it a point to show that Thomson was not first to use lobelia.

[‡] Thomson's Mat. Med and Anat., 13th edition, p. 585.

[§] English Poison Schedule, (1868) This is an English law, designed to protect the public against intentional and accidental poisoning. Among the omissions are such energetic bodies as sulphuric, nitric and hydrochloric acids,

In reviewing the cases we find few convictions resulted, and, even then the sentences were light. It seems to us that the prosecution failed because as a rule the evidence did not show that lobelia was really a poison. The members of the Regular Medical Profession were usually the aggressors and seemed anxious to convict, but evidently had at that time but little personal acquaintance with the drug. Their statements in court were usually based upon the papers in Thacher's and Cox's Dispensatories, whereas, the Thomsonians would produce abundance of testimony to show that lobelia in immense doses, far beyond the amounts named as poisonous by the prosecution was continually taken without fatal effects. They would bring as witnesses those who had taken the drug, and they evidently impressed the court with the fact that the Thomsonians were more familiar with lobelia, than were the members of the Regular Medical Profession.

There was another factor in this case, that we cannot underestimate. The cry of oppression and persecutions was raised and the sympathies of many people enlisted in behalf of the Thomsonians from this stand. The Thomsonians of that day were not altogether uneducated as some now suppose. Upon the contrary, we find that many highly cultivated persons adopted their methods and bought the "right." Prof. Benj. Watterhouse, (Professor of Theory and Practice of Medicine in Harvard,) was zealous, also Prof. Tully, of Yale, and throughout New England Thomson numbered his followers by thousands, from among the best informed families. Thus it is, that Thomsonism did not meet the popular disfavor that it held with the Medical profession. To sum up we may be pardoned for observing,

We believe that lobelia is not an active poison, but that injudicious use might result fatally, as is true of other moderately energetic remedies. No doubt more fatal effects would result from its use if it were not so violently emetic that the effect of a poisonous dose of the drug is first to expel it from the stomach.

The physiological investigations of Prof. Roberts Bartholow following, show conclusively that the alkaloid lobeline is poisonous and will produce death in animals.

The Actions and Uses of Hydrobromate of Lobeline.—(Written for this publication by Prof. Roberts Bartholow, M. D., LL. D., Professor of Materia Medica, General Therapeutics and Hygiene, in the Jefferson Medical College, of Philadelphia.)—*Preliminary.*—This research consists, for the most part, of my own experiments and observations. Facts obtained from other sources have been adopted when my own experiences were in harmony with them. The preparations used were furnished me by Prof. J. U. Lloyd, whose name is a

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(the English Journals often give records of death by them). We presume that the commerce of that country would render it useless to attempt to control these substances. Ergot and oil of savin are listed, and it seems that to these should be added oil of cedar, oil of tanzy, oil of pennyroyal, and perhaps gossypium bark, if the unborn are to be considered. Oxalic acid is named, but binoxalate of potassium (a common drug here) omitted. These and other features seem to us to indicate that the list should be revised, and certainly twenty years in our country would demand a revision.

In the recent excitement in England over a death after taking lobelia, many writers urged that lobelia be placed on the poison schedule. In our opinion, this could not be consistantly accomplished without adding ipecac, turpeths mineral, and perhaps other like substances. Doubtless, English pharmacists generally agree that a careful revision of their poison schedule is desirable, but, we doubt if it will ever be possible to include all moderately energetic drugs that by abuse may produce death, as is perhaps true of lobelia. In our country lobelia is not considered to our knowledge in any list of poisons. Our hillsides are covered with the herb, its properties are well known, and it is never used as a poison by those inclined to produce death, but is freely employed as an emetic by country people.

[*] See note † p. 84.

[†] Dr. R. K. Frost, of New York City, was arrested and tried December 13, 1837, for killing Mr. T. G. French by putting "him into a vapor bath" and administering "poisonous concoctions of lobelia" and "giving deleterious herbs which no reasonable man would administer to a dog." This trial, next to that of Thomson, exhibited the intensity of feeling that existed at that time, and from over the entire country it attracted the attention of persons who were the least interested in medicine. It lasted ten days and the jury returned a verdict of "guilty of manslaughter in the fourth degree," and recommended the accused to the mercy of the court. He was sentenced to three months imprisonment. The history of this trial was issued in pamphlet form (104 pp.) and used by the Thomsonians over the country to show that they were persecuted.

sufficient guarantee of their genuineness. They consisted of one per cent., and one-tenth per cent. solutions of the hydrobromate of lobeline. The investigation includes the physiological and clinical actions of this remedy.

General Result of the Action in Cold and Warm-blooded Animals.—Given in sufficient quantity, an increasing failure of muscular power, staggering and incoordination, retching and salivation, are observed in from five to fifteen or twenty minutes after it is administered. First occurring in the hind extremities the evidences of muscular paresis, then extend to the fore members The frog becomes less and less able to jump and to turn over from a position on the back, and the rabbit yields in the hind legs, reels, and at length can no longer control these members, and the forearms and arms soon after are disabled in the same manner; sensibility and the brain functions remain unimpaired. Before the paralysis has become complete, if the amount given has not been too large, the receptivity and response to peripheral impressions is for a short period somewhat more ready, and this is, more especially true of frogs. The respiratory function is embarrassed in proportion to the general paralyzing action After a period of rather slower respiration it becomes quicker and increasingly shallow and laborious. With the lessening supply of oxygen, carbonic acid narcosis comes on, and death ensues with complete muscular resolution and without convulsions in frogs, and usually with clonic convulsions in rabbits the failure of respiration being the immediate cause

Action on Nerve and Muscle.—When the sciatic nerve is isolated, the limb ligatured, and a merely paralyzing dose is administered, the nerve when excited by a faradic current at the earliest period of the action responds feebly, for the muscles of the limb below the ligature contract but slightly When the paralysis is complete at length the strongest excitation of the nerve causes no response in any degree of muscular contraction. When this occurs the muscles are found to be readily excitable on direct electrical stimulation. It follows hence that lobeline destroys the excitability of the motor nerve endings, and does not impair the contractility of muscle.

There is a stage in the action of small doses, however, when the irritability of motor nerve and muscle is actually heightened: when the paralyzing effect is just begininning to manifest itself after the administration of one minim of the one per cent. solution, a slight tap on the skin of the back causes an immediate response in general muscular movement of a tetanic character From this it must be concluded that when the first impression of lobeline is making, the nervous tissue is irritated by the medicament, but as the action continues and increases, the irritation is succeeded by loss of function. Furthermore, when the effect of lobeline in small quantity is such as to cause general muscular contractions on irritation of the skin (heightened cutaneous reflex) it is obvious that the physiological effect is not limited to the motor-nerve endings, but includes the spinal cord as well. It may be suggested, that the paralyzers, whose action is first felt by the intra-muscular nerve elements really act through the spinal cord and not as is now supposed on the nerve endings only at the beginning.

Sensibility remains unimpaired, certainly, up to the period of the cessation of all muscular contractility, for the corneal and other reflexes are preserved until then. When the action of lobeline has attained its maximum, the paralysis is complete, and there is no response to any form of irritation.

Effects on the Circulation and Respiration —When the fullest effect of lobeline is attained in the frog, if the chest be opened the heart will be found still in action at about 28 per minute, but the contractions are not energetic, although rhythmical. If the medulla be previously divided, the heart will be found at a standstill, its cavities distended. If in action, electrical stimulation increases it; if at rest, a strong faradic current will start the auricle in active movement, and the ventricle in feeble and irregular contractions chiefly of the basic portion.

The most important of the effects of lobeline on the heart, is its action on the vagus At first, and with a small dose, the vagus is briefly stimulated then depressed in function, but, it is completely paralyzed at the period of maximum effect, and no strength of current will then stop the heart With a minute dose, the effect first produced is irritation of the vagus, with slowing of the heart, but as the effect deepens, the heart grows more rapid with lessening of the inhibition It is probable that every first dose given, causes some slowing of the heart's movements, but this effect is so transient and slight that it escapes detection With the decline in the inhibition there ensues increased action of the heart and lowering of the vascular tension The body temperature rises somewhat *pari passu* with the increased rapidity of the circulation As the respiratory muscles fail in power, the breathing becomes more and more labored, panting and shallow The oxygenation of the blood is progressively diminished carbonic acid accumulates, the lips are cyanosed, and stupor is succeeded ultimately by coma. Up to this point the mental processes are not disordered, and the sensibility remains unimpaired

Therapeutical Applications of Lobeline.—To avoid all subjects of controversy, I confine my observations to facts personally ascertained, and give the results of my own therapeutical uses of this remedy.

Having ascertained that lobeline possesses the power to lessen the reflex action of the spinal centres, I have administered it in those maladies characterized by irritability or exaltation of this function. In *epilepsy* it appears to be a most promising remedy if right conditions exist. It is the less useful, the more decidedly the convulsive seizures approach the epileptiform character, and it is more effective, the nearer the cases are to the true or essential type The bromides may be quite successful in arresting convulsions due to coarse lesions of the brain, although not acting on the structural changes in any way. Now lobeline does not act favorably in such conditions.

In nocturnal epilepsy, which, as is now well known, does not usually yield to the bromides, and in the cases not arising from an obvious peripheral irritation or accompanied by a defined aura, in the pale-anæmic and lymphathic type of subject, the best results obtainable from this remedy may be expected. As, however, definite conclusions can be formed only after sufficient length of observations the real value of the hydrobromate of lobeline must be ascertained by comparative trials through several years. Now, it can be asserted merely that this remedy promises well.

More definite results can be given from the administration of lobeline in certain neuroses of the respiratory organs, as *asthma*, *whooping-cough*, *pseudo-angina pectoris*, in the *spasmodic cough* of emphysema, the *cough* of habit, renal and other *reflex asthmas*. Somewhat more specific statements can be made as respects its utility in all these cases.

In that form of asthma, which is merely a functional disorder, the best results may be expected from it. The dose at the outset should be about 1-60 grain, and this can be repeated in a half hour when the attack is acute and severe, and afterwards *pro re nata*. When the attacks are recurring and persistent, the lobeline should be given three times a day from 1-60th to 1-30th grain, in persons having the ordinary susceptibility to its action, and 1-20th grain in those with less. When desirable or circumstances require, it may be combined with morphine, or cocaine, or both. The asthmatic seizures which attend emphysema are often quite promptly relieved by it. When in the course of chronic bronchitis, the mucous membrane furnishes but little secretion and the cough is dry and harrassing, lobeline acts very efficiently. It has also appeared to do great good in cases of pseudo-angina pectoris, with weak action of the heart and embarrassed respiration. By lowering the vascular tension and lessening the work of the heart by relaxing the inhibition, the pulmonary circulation is carried on with greater ease, and hence the distress of breathing subsides. There is here, as I conceive, a most important sphere of usefulness—for this morbid complexus is by no means uncommon, and we have not many agents capable of affording the direct relief given by lobeline.

THE HOMŒOPATHIC USES OF LOBELIA INFLATA.—(Written for this publication by Prof. Edwin M. Hale, M. D., Emeritus Professor Materia Medica and Therapeutics in the Chicago Homœopathic College).—I consider that the sphere of action of this species lies midway between tobacco and veratrum album, or their active principles, nicotine and veratrine. It acts upon the motor-nervous system and upon the respiratory centre in the medulla.

The nauseous effects of this drug are far more intense then tobacco, and this is the principle reason why it is not used for the same purpose as tobacco. Another reason is that the system does not tolerate the drug, as it does tobacco. I have, however, seen habitues of lobelia, who, from taking it for asthma and dyspepsia, came to tolerate it to a degree which seemed surprising.

Lobelia inflata was first introduced into our school in this country at the same time and in the same manner as the Lobelia syphilitica, (1838). In 1841 it was introduced into homœopathic practice in Europe by Dr. A. Arac, of Leipsic, in the 15th volume of "Hygiea." Since that time it has been used to a considerable extent in our practice, but although a powerful drug, its curative sphere is limited.

We find it useful principally in asthmatic affections. It is useful in two varieties, namely, the nervous, which arises from paresis of the respiratory centre, and the catarrhal or "humid asthma." In the first, it is strictly homœopathic, and has been found curative in very minute doses. In the latter, when the mucus rales are loud, and the sense of suffocation is due to a mechanical obstruction by the mucus, and the coincident spasm of the bronchi, larger doses must be used, for this condition is similar to the secondary effects of the drug. I have seen almost magical relief follow doses of ʒi repeated every hour, without nausea or vomiting follow its use.

Permanent cures of asthma of many years, have been made by larger doses. Sometimes these large doses (half an ounce) have not caused vomiting. At other times smaller doses vomit violently, leaving the patient much prostrated, but with disappearance of the asthma. I have cured asthmatic attacks by small doses of veratrum, when lobelia seemed indicated but had failed.

In some cases of asthma, the patient complains of a "dreadful sinking sensation" in the epigastrum with violent distreping efforts at inspiration. This is a clear indication for the use of lobelia, and it will promptly relieve such cases in doses of 1-10 or 1-100 of a drop frequently repeated.

In cough, lobelia is very useful. The cough may be caused by accumulation of mucus in the pharynx or bronchi, or a tickling in the larynx, or it may be "croupy," or attended by dyspnœa. In purely nervous coughs, like whooping cough, or from irritation of the laryngeal nerves, motor and sensory. In spasmodic croup, it is a prompt and excellent specific, and I have found it useful in carpo-pedal spasms, attended by laryngismus.

In some gastric disorders, lobelia does excellent service. In the so-called nervous dyspepsia, when the patient complains that nausea, oppression of the stomach, and dyspnœa follow each meal, when there is constant "faintness" at the stomach, as bad after meals as before eating, lobelia in doses of a drop of the one-tenth dilution before and after eating has a very happy effect.

This "faintness" at the pit of the stomach is an unfailing guide to its use. It is caused by a paresis of the sympathetic nerve; other drugs cause this symptom; ignatia, cimicifuga, digitatis, and veratrum, all cause it by their depressing action on the same system of nerves. The primary effect of lobelia on the heart is to paralize its motor nerves, like tobacco or aconite, hence it is a prominent remedy in primary cardiac weakness and irritation. The "sinking faintness" at the epigastrum is here the symptom most complained of. Small doses must be used to combat this condition. Some patients will bear doses of one or two drops of the tincture, others are made worse by it, and only find relief from the second or third dilutions.

The secondary or reactionary effects of lobelia, is to cause violent spasmodic palpitations, or symptoms closely resembling angina pectoris. In such cases I have found quick and good results from 5 to 10 drops of the tincture.

Primarily, lobelia paralyzes the various sphincter muscles, and can be used in physiological doses, for spasmodic retention of urine, or faeces, or rigidity of the os and perineum. Its use in labor in facilitating the expulsion of the fœtus is as old as the aborigines. It has been adopted by midwives and many physicians. I have seen a rigid and undilatable os rapidly give way after a single dose of 20 drops. It will allay and regulate those violent pains in the loins during labor, which seem to arise from the rigidity of the genital passages. In dysmenorhœa, due to this same cause, small doses give prompt relief. In this respect it resembles gelsemium and belladonna.

In hysteria, lobelia is frequently indicated. The case of spasm of the larynx reported by Dr. Knowles, of Avoca, Iowa, in my "Therapeutics of New Remedies," is an apt example of a manifestion of hysteria, rapidly cured by this remedy. I have controlled the most violent hysterical convulsions by injecting into the rectum a teaspoonful of the tincture.

In gall stone or renal colic, in incarcerated hernia and in spasmodic gastralgia, lobelia often relieves promptly. This may be said to be antipathic, but I do not believe it. The secondary effect of all paralyzants is spasm and convulsions. Lobelia is as homœopathic to spasm, as to paralysis.

MEDICAL USES OF LOBELIA IN THE ECLECTIC SCHOOL.—(Written for this publication by Prof. John M. Scudder, M. D., Professor of the Practice of Medicine in the Eclectic Medical Institute, Cincinnati).—We use lobelia for its emetic, its relaxant and its stimulant influence. It is a fair example of the common fact that the action of a drug depends upon its dose. Emesis may be called its poisonous action, and stimulation its medicinal action. In poisonous doses the drug would prove fatal to life were it not that it is expelled from the stomach and exhausts itself in the act of emesis.

Without discussing the advantages of thorough emesis, as compared with other treatment, it may be remarked that the indications and contra-indications for emetics are as distinct as for other remedies. If the patient has full tissues, full pulse, full tongue, heavily coated at base, with sense of fullness and oppression in the epigastrium, lobelia will act kindly. Conversely if the the tissues are contracted, the pulse small or hard, and the tongue contracted and red, an emetic should not be used.

In the early part of the century lobelia in substance (usually the powdered seed) was given as an emetic. From this use came the extreme prostration, with cold clammy perspiration and enfeebled respiration and circulation, a condition known as the "alarming symptoms." There is no doubt, but that lobelia has occasionally caused death, but this result has been rare as compared with the large number of cases in which the drug has been used.

It was not long before it was determined that an acid preparation of lobelia acted more kindly than the crude article, or indeed any other preparation The acetous tincture was easily and cheaply prepared by simply macerating the herb and seed with vinegar, and whether as an emetic or a nauseant expectorant its influence was certain and kindly.

The relaxant influence of lobelia was twofold, as it was exerted on the voluntary and involuntary muscles. For the first, it was the result of more or less profound nausea, induced by large doses just short of emesis. This effect was frequently called "antispasmodic," and was that desired in infantile convulsions, puerperal convulsions, hysteria, tetanus and some cases of asthma. This protracted nausea was also thought necessary to the establishment of mucous secretion from bronchial tubes, the so-called expectorant action.

Its action on the involuntary muscular fiber was not dependant upon nausea. Probably its best and most certain action was in cases of difficult labor from rigidity of the os uteri. In this case an alcoholic tincture from the seed was employed, twenty drops being added to two ounces of water, a teaspoonful was given every fifteen minutes until dilatation was accomplished.

With a full and oppressed pulse and a sense of oppression in the chest lobelia is one of our most certain remedies. The small doses (tincture of the seed) not nauseant, gives relief and a better circulation of blood.

In neuralgia of the heart, and in angina pectoris, no remedy that I have used gives such prompt relief. Frequently a single dose of ten or fifteen drops of a tincture of the seed will give almost immediate relief.

Before the use of belladonna to remove congestion of the brain (patient being comatose) nothing was deemed so certain as a lobelia emetic. In the eruptive fevers with tardy appearance or retrocession of the eruption, nothing was so effective in relieving the nervous system and bringing the eruption to the surface as a lobelia emetic properly given.

When remedies are used in combination it is almost impossible to determine the action of a single agent. Thus many compounds containing lobelia have been highly commended, and have done good service, but what part should properly be credited to this agent we cannot say Among these combinations none has acquired a greater reputation than the compound stillingia liniment, composed of oils of lobelia, stillingia and cajuput, with alcohol.* This has certainly a wonderful action in croup, and I have satisfied myself by experiment that a principal action is from the oil of lobelia.

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*See formulu, p. 82.—*L.*

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[*] This unique publication was issued monthly in the interest of the lobelia practice, during the year 1839. It was not supported, and only one volume appeared. We are indebted to Dr. Charles Rose for the volume complete, probably the only copy in existence. In its front is bound the "Trial of Dr. Frost." We do not refer to pages in this work, its title showing that the entire subject is connected with lobelia.

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1878.—Pharmaceutical Journal and Transactions, London, p. 561.
1878.—Organic Constituents of Plants, Wittstein, p. 122.
1878.—Dispensatory and Pharmacopœia of North America and Great Britain, Buchanan & Siggins, pp. 194, 196, 574.
1878.—New Remedies, Wm. Wood & Co., pp. 21, 84.
1879.—Pharmacographia, Fluckiger & Hanbury, p. 400.
1879.—National Dispensatory, (and subsequent editions,) p. 859.
1880.—Pharmacopoea Homoeopathica, Polyglotta, p. 222.
1880.—Pharmacopœia of the United States, pp. 8, 131, 211, 349.
1880.—Therapeutic Gazette, pp. 34, 94.
1882.—New Remedies, Wm. Wood & Co., p. 240.
1882.—Druggist's Circular, p. 158.
1884.—Plant Analysis, Dragendorff, (Greenish's Translation,) pp. 50, 202.
1885.—Materia Medica and Therapeutics, Bartholow, p. 583.
1886.—American Journal of Pharmacy, p. 392.

We do not consider it necessary to mention all the works that refer to this plant and its compounds. Since 1809 medical publications of every description have continually mentioned the plant, and medical references are innumerable. In order to arrive at a correct understanding of the subject, we made comparative studies of the record as found in the preceding works, and have found other publications to present no additional facts. We may safely say that the lobelia history can be as intelligently studied in these as by the aid of additional numberless works that mention the plant.

LOBELIA SYPHILITICA.

BLUE LOBELIA.

Part Used.—The entire flowering plant* Lobelia syphilitica, *Linnæus*. Natural Order, Campanulaceæ, Tribe Lobelieæ.

Botanical Description.—Blue Lobelia is generally found in damp, low grounds, wet meadows, and especially near streams. The stem is usually unbranched and grows erect from one to two feet high. It is angular below and smooth for the most part, or with a few scattered hairs. It has numerous horizontal leaves and late in summer a terminal showy spike-like raceme of large blue flowers.

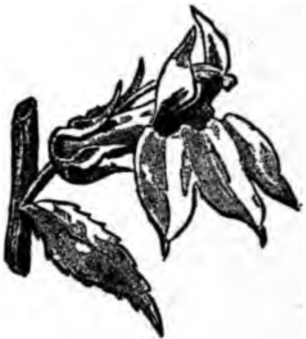

Fig. 138.
A flower of Lobelia syphilitica. (Natural size).

The leaves are ovate-lanceolate, tapering to both ends, sessile or the lower with a margined petiole, and are three to five inches long, veiny, soft, dark green above, and lighter beneath. The margins are irregularly, erosely serrate. The leaves are very numerous, and as they are gradually shorter from the bottom up they give the plant a pyramidal aspect.

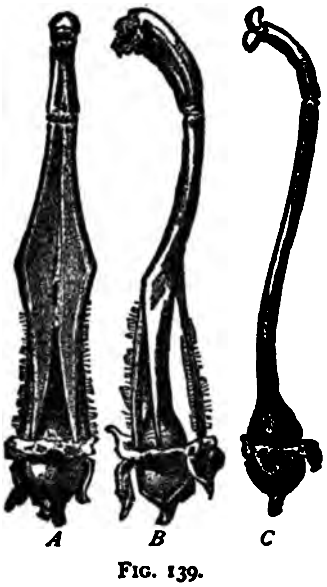

Fig. 139.
The stamenate and pistillate columns of Lobelia syphilitica; *a*, front (under) view of a column; *b*, side view of same; *c*, pistil, stamens being removed. (Enlarged).

The flowers appear the later part of August, lasting till frost. They have the same general structures as those of Lobelia inflata, the same characteristic corolla tube, but are much larger, being about one inch long. They are borne on short thick hairy peduncles in a terminal raceme.

The flowers are subtended at their base with leafy bracts which are large and leaf-like below and smaller above. The bracts have margins ciliate with white hairs, and when the plant is just beginning to develope its inflorescence, these bracts form a dense, roseate, terminal cluster, the numerous marginal hairs giving it a glandular appearance.

The calyx segments are five and are triangular, and have recurved margins which are prolonged at the base forming an ear-like appendage at each angle between the segments.† The segments are about three-quarters the length of the corolla tube. The corolla tube is from one-half to three-quarters of an inch long, split to the base on the upper side, and prominently five pliate beneath, the interior angles

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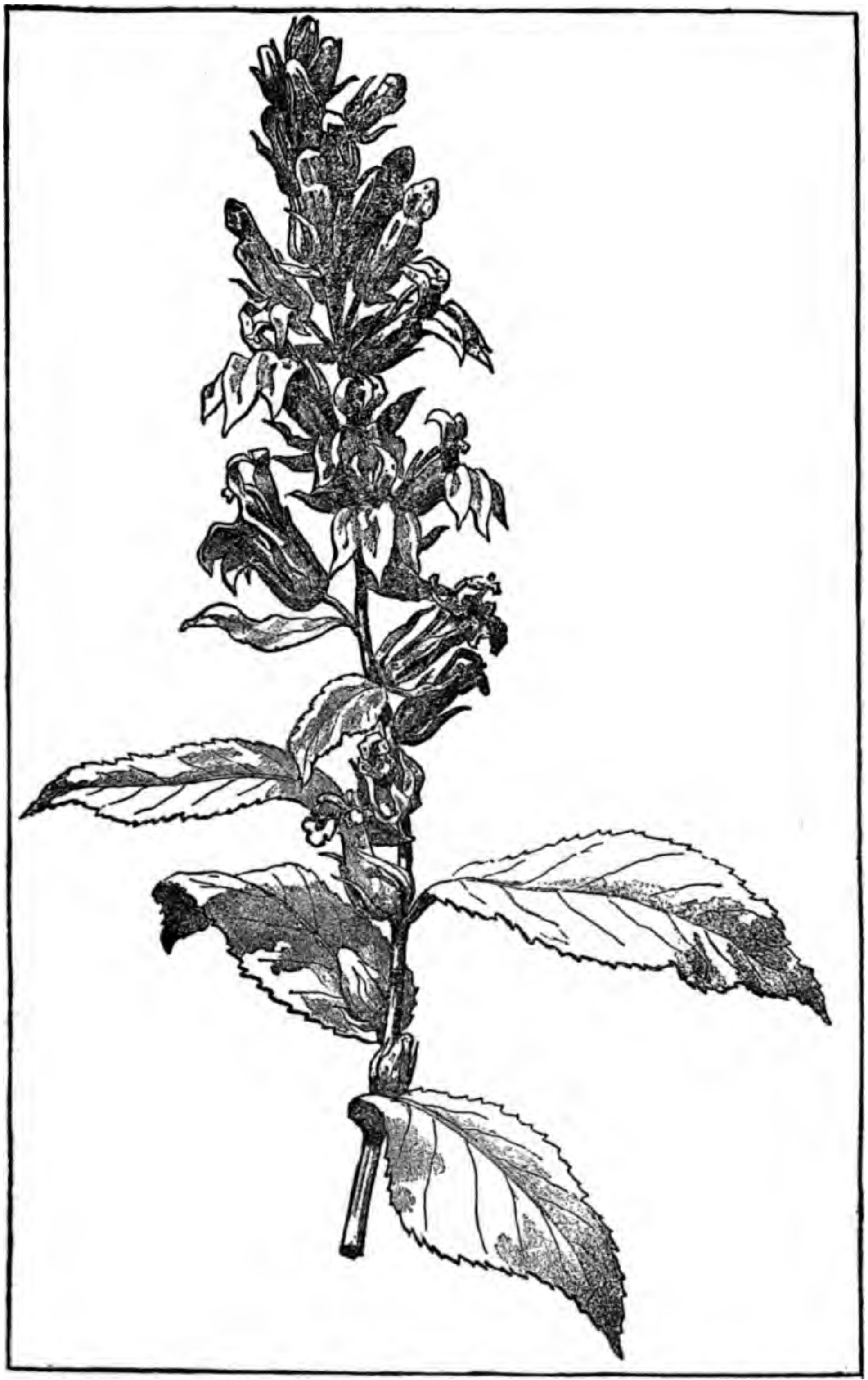
*The Homœopaths who are the only school of medicine that use the plant employ a tincture of the entire plant. When introduced into medicine the root was the part employed.

†These ear-like appendages are not found on all species of Lobelia and form an artificial means of dividing the genus.

PLATE XXXVI.



LOBELIA SYPHILITICA.
(FLOWERING SPIKE, NATURAL SIZE.)

being of a brighter (almost white) color. The three lobes forming the lower lip of the corolla are reflexed, broadly triangular and subequal.

The five stamens are united together around the pistil, forming a column about the length of the corolla and protruding through its slit. This column is three-sided at the base and curved downward at the summit as shown in figure 139, p. 98. The five united anthers are not equal, the lower two being slightly shorter and tipped with a cottony tuft; they are of deep purple color and open with shallow slits down the back.

The pistil is enclosed in the tube formed by the stamens. This is a provision of nature that insures cross-fertilization. When the flower first opens and the stamens shed their pollen, the stigma is completely enclosed by the anthers and thus is prevented from receiving any of the pollen; afterwards when the pollen has been scattered, the style elongates, pushing the stigma a line or two beyond the tube, and is then fertilized by pollen from other flowers, mostly through the agency of bees and other insects.

Blue Lobelia is a very showy plant when in bloom, the deep blue color of the large flowers making it conspicuous. This color is well preserved when the plant is pressed carefully with frequent change to dry papers, but fades out in course of several months from the dried specimens. Sometimes, very rarely however, albinos are found with pure white flowers.*

After blooming the corollas do not fall off, but turn brown, wither up, and remain attached to the ripening seed-pods.

COMMON NAMES.—The most common name and the one most generally used for this plant is Blue Lobelia. While there are other species of Lobelia with blue flowers, (in fact all but a few have this color), still, the flowers of this plant are so much larger, conspicuous and brighter blue than any other, the name properly belongs to it. In most books it is called Blue Cardinal flower, sometimes incorrectly abbreviated to Blue Cardinal, but in our opinion the name is not appropriate. Cardinal flower is a name applied to Lobelia cardinalis, not from any resemblance of form to a Cardinal's cap, but from the bright scarlet color of its flowers. Lobelia cardinalis, the first species introduced into Europe was very properly called Cardinal flower ("Cardinale couleur de feu"—Tournefort, 1719), and when a second species, but with blue flowers was introduced, it was quite naturally called *Blue* Cardinal flower. We think that this is contradictory, the name Cardinal as applied to the flower refers exclusively to the color, and it is manifestly wrong to speak of Blue Cardinal in the same sense.

It is said that among the more ignorant classes who used this plant in domestic practice, it was known as High Belia, the supposition being that as the other kind (*Lobelia inflata*) was called *Low* Belia this must be the *High* Belia.

BOTANICAL HISTORY.—This plant was in cultivation in England as early as 1665, as it was mentioned in Rea's Flora published in London in that year, and it was cultivated in France no doubt a number of years earlier, it being mentioned by Lobelius in 1591.†

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*These were noticed and described as a distinct species as early as 1680 by Morrison. Tournefort, 1719, calls them by the common name "Cardinale blanche." They are according to our observation of a rare occurrence. Although the plant is a common one around Cincinnati, we have seen but a single albino. This was growing in a patch of the ordinary blue flowers, and it was *pure white* without a trace of coloring.

†Lobelius Icones Stirpium, Antwerp, 1591, mentioned under the name *Trachelium Americanum, flore ca-*

In most early works it was described under the generic name Rapunculus.[*] When Linnæus was preparing his Species Plantarum, Peter Kalm[†] had just returned (1751) from America with wonderful accounts of the virtues of this plant as a certain cure for syphilis,[‡] (see Medical History,) and Linnæus gave the name syphilitica as the specific name for the plant.[§]

Although its reputation as a cure for this disease has long been disproved, still the name remains, and probably always will, a monument of an early error. It has never had but one synonym, Rapuntium syphiliticum, by Miller.

Description of the Drug.—All parts of Lobelia syphilitica are devoid of prominent characteristics. The plant is insipid and herb-like, the fresh root has simply a turnip-like taste. The root is the portion that was directed to be used when the plant was introduced, but at present no portion of the plant is an article of commerce.

According to Rafinesque[||] it was once analyzed in France, but the result did not show it to contain a characteristic constituent. We did not consider it necessary to make any investigation.

Lobelia syphilitica has never been officinal, but was recognized by the Pharmacopœia of the Massachusetts Medical Society, 1808. It is not found in commerce and is not used in domestic medicine.

Medical History.—We have stated above that Peter Kalm in his travels through North America was informed by Sir William Johnson[¶] that the Indians used this plant to cure

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ruleo. (Linnæus' citation to this in Species Plantarum, 2nd and later editions, [not 1st,] is "Rob. ic." and Barton copies the error).

[*] Rapunculus Americanus, flore dilute cæruleo.—Dodart, Mémoires pour servir a l'Histoire des Plantes, Paris, 1676, p. 297.

Same—Tournefort, Institutiones Rei Herbariæ, Paris, 1719, p. 163.

Rapunculus galeatus Virginianus, flore violaceo majore.—Morison, Plantarum Historia universalis, Oxoniensis, 1680, vol. ii., p. 466.

[†] Peter Kalm was a Swedish naturalist who traveled three years in the northeastern portion of this country from the fall of 1747 to the spring of 1751. He was a pupil of Linnæus, and it was at his advice that the journey was made. On return to Sweden he wrote a detailed account of his travels, which was published in three volumes in 1753, 1756 and 1761, and was translated into German, French and English, the latter translation by J. R. Forster was printed in London in 1770-71.

It was Kalm who furnished the most of the specimens of North American plants described in the Species Plantarum of Linnæus. These plants are marked with the letter K, in the Linnæan herbarium, and constitute the greater part of the plants from this country that are in the collection.

When Kalm was in this country he learned from Sir William Johnson of the reputation of Lobelia syphilitica among the Indians for the cure of syphilis, and on his return wrote an account which was published in Latin.

[‡] Kalm published his account in the Act. Acad. Scient. Holmen., under the title "Lobelia ut efficax remedium contra luem venereum, a Petro Kalmio descripta."

And another account in Latin was written in 1756, by Peter Engstroem, a pupil of Linnæus, and published in the Amœnitates Academicæ, vol. iv., p. 524.

[§] Species Plantarum, Linnæus. 1753, page 931. Described in the Class "Syngenesia Monogamia" and with the following specific description.

"Lobelia caule erecto, foliis ovato-lanceolatis crenatis, calycum sinubus reflexis."

[||] Medical Flora of the United States, vol. ii., p. 25.

[¶] Sir William Johnson was born in Smithtown, Ireland, 1715. In 1738 he came to America and located in the south side of Mohawk Valley, about twenty-four miles from Schenectady, N. Y., and embarked in traffic with the Indians whose friendship he managed to secure. He learned their language, studied their customs and won their confidence. He possessed greater influence over them than any other white man, and was adopted into the Mohawk tribe and chosen sachem. In the French war, 1743 to 1748, he was the sole superintendent of the Indians of the frontier; occupied positions of trust in Colonial affairs and embarked with the Indian allies in the wars between England and France. He engaged in the capture of Fort Niagara, 1750, where he had command after Prideaux was killed, and he assisted in the capture of Montreal, 1760. For his service he was awarded a good salary by George II., a baronetcy and $25,000 by Parliament, and a tract of 100,000 acres of land, north of the Mohawk, known as "Kingsland" or the "Royal Grant." This tract of land is now in Herkimer Co., N. Y.

He published a paper on "Customs, Manners and Languages of the Indians. (Phil. Trans. Nov. 1772, p. 142). In 1774 he died.

At some period of his life, (date unknown to us, but before 1751 as he communicated it to Kalm) he purchased from the Indians (or a trader) an asserted remedy for syphilis, which proved to be a species of Lobelia, and the plant was exported to Europe to cure that disease. From this reason the plant received its name Lobelia syphilitica. In this syphilis,[*] and upon his return to Europe, published an account of it. This introduced the drug to Europe, and it came into immediate demand, and it was illustrated in Woodville's Medical Botany, which was published in the beginning of this century. We cannot find that Johnson made any written reference to the drug, and we have searched his manuscripts upon file in Albany, which comprise a voluminous correspondence on all matters connected with Indian life on the frontier.[†] We cannot find a reference in European literature to any statement beside that of Kalm and we therefore conclude that this information derived personally by Kalm, introduced the plant.

Schœpf, 1787,[‡] mentioned Lobelia syphilitica, but erroneously described to it, nauseating, cathartic and emetic properties, stating that it is acrid, milky, and used in syphilis. He confused the sensible properties of Lobelia inflata, with which he was evidently familiar, with the reputed medical properties of Lobelia syphilitica. Thus, his statements regarding the uses of Lobelia syphilitica agreed with Kalm, but there is no evidence to show that he did not derive his information from Kalm's writings.

From the return of Kalm (1751) to Europe, until the introduction of Lobelia inflata by Thomson,[§] the drug known as *lobelia* was the root of Lobelia syphilitica. This is shown by the fact that the decoctions were freely administered, which could not have been the case with a violent emetic like Lobelia inflata. Thus, we quote from Buchan, 1793.[‖] "The patient takes a large draught of the decoction early in the morning and continues to use it for his ordinary drink through the day." This name lobelia, led subsequent writers (after Lobelia inflata appeared) to confuse the two plants, and the result is sometimes evidenced at present.

Statements have been made to the effect that Lobelia syphilitica has diuretic properties, but Prof. W. P. C. Barton, 1802,[¶] found that the plant then used by the settlers under the name lobelia was Liatris spicata.

Thatcher, 1810,[**] states on Pearson's word that Lobelia syphilitica has cathartic properties, but it is questionable as to the drug employed.

Rafinesque, 1830,[††] accepts that Lobelia syphilitica is a potent drug, but his views were framed from previous statements. Investigations in Europe demonstrated that Lobelia syphilitica was of no value in the treatment of syphilis and it eventually became obsolete. Neither, the Regular, nor the Eclectic sections of American practitioners of medicine employ it at all, and that it is but little employed in Homœopathy is evident from the following article:

THE HOMŒOPATHIC USES OF LOBELIA SYPHILITICA.—(Written for this publication by Edwin M. Hale, M.D., Emeritus Professor of Materia Medica and Therapeutics in the Chicago Homœopathic College.)—This plant was introduced into our practice by the late Dr. Hering. His provings and observations were published in the Trans. Amer. Hom. Institute.

Drs. Jeanes, Williamson and Neidhard, only the latter now living, contributed their experience with this drug. Dr. Jeanes reports a cure of "melancholia" in a woman. He supposed the spleen was affected, for she had "pains under the short ribs of the left side, from front to back." These symptoms are

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connection we are led to say upon information received from a gentleman, familiar in the neighborhood of "Johnson's Castle," New York, that by tradition the moral standing of Sir William Johnson was not of the highest, and that possibly he may have had use for the plant himself.

[*] Johnson purchased the information from the Indians and its announcement was considered of the greatest importance by the medical world. He was imposed upon, however, and it seems strange that a man so versed in Indian customs should have been thus deceived.

[†] These manuscripts in the State's Dep't Albany show the interest and influence Johnson pussessed in early Colonial affairs. His aid was solicited by those high in power and he must have had the unbounded confidence of the Indians.

[‡] Materia Medica Americana, p. 128.

[§] See medical history of Lobelia inflata, p. 83.

[‖] Domestic Medicine, William Buchan, Edinburgh, p. 513.

[¶] Collections for a Vegetable Materia Medica, part 2nd, p. 37.

[**] American New Dispensatory, p. 149.

[††] Medical Flora of the United States, vol. ii., p. 25.

in its provings, and nearly identical symptoms have often been cured by cimicifuga. Dr. Neidhard reported a cough of four weeks duration, day and night, with "dryness of the back part of the throat." He also cured cases appearing to be a species of spinal irritation with sciatica

Many of its symptoms remind one strongly of cimicifuga, but its chief sphere of action seems to be upon the mucous surfaces of the upper respiratory tract. It causes catarrhal headache, acute nasal catarrh, and much irritation with dryness of the throat. The posterior nares, palate, eyes, nose and mouth are all irritated, much as in hay fever. I would advise it in such cases, and in epidemic influenza, especially in the young. Catarrhal conditions caused by this species, it continued, would readily run into humid asthma.

Rafinesque asserts that its properties are similar to Lobelia inflata, but milder It resembles arsenious iodide, sticta, hepar sulphur, cistus and cimicifuga. Our tincture is made from the leaves.

LOBELIA CARDINALIS.

CARDINAL FLOWER

PARTS USED —The entire plant, Lobelia cardinalis, *Linnæus.*

Natural Order, Campanulaceæ, Tribe Lobelieæ.

BOTANICAL DESCRIPTION.—There is no difficulty in recognizing this plant without a detailed botanical description. Having the peculiar flower structure of the Lobelia genus (described on page 64) it is at once known by its bright scarlet flowers, so brilliant indeed as to attract immediate attention from anyone who sees it in bloom

In this country we have but two red flowered species of this genus. Lobelia cardinalis, which is common over most of the territory east of the Mississippi, and Lobelia splendens, very similar in appearances, but confined to the extreme southwest near the Mexican border, and hence, not liable to be confused.

In size, habit and general appearances, the plant resembles Lobelia syphilitica, (described and illustrated on page 98,) but strongly distinguished from it by the color. The flowers of the Lobelia cardinalis are more slender, the column longer, and the calyx destitute of the reflexed auricles between the segments. Over the greater portion of this country, the two species Lobelia cardinalis and Lobelia syphilitica are all of the genus that have large enough flowers, (over an inch long) to attract attention; the former having red, the latter blue flowers, they are readily distinguished from each other and from all other species

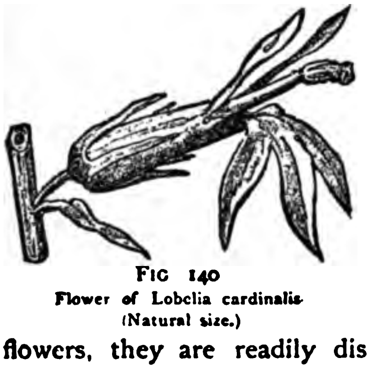

FIG 140
Flower of Lobelia cardinalis
(Natural size.)

The peculiar bright red color of the large flowers of Lobelia cardinalis is so bright as to pale almost any comparison we can make. No colored illustration we have ever seen of the plant does it justice, and the usual fault of colored work is the over-coloring of plants. When the plant is dried carefully the color is preserved as bright as when fresh, and it is very permanent, remaining a beautiful herbarium specimen for a number of years.

As so much space has been given in this work describing the botanical characters of Lobelia inflata and Lobelia syphilitica, we do not deem it necessary to give a further description of this plant.

BOTANICAL HISTORY.—The richness of coloring of the bright scarlet flowers of this plant attracted the attention of early settlers and travelers, and it was sent to Europe very soon after the discovery of this country. It was first sent to France by the French settlers in America.

Over 250 years ago, (1629,) Parkinson[*] described and figured it from plants in cultivation in his garden at London and informs us that he received it from France.[†] He states, "it groweth neere the river of Canada, where the French plantation in America is seated." It soon became common in cultivation in Europe, especially in botanical gardens, and is mentioned in most of the earliest works on American plants.[‡]

In the very early works it was described under the generic name Trachelium or later Rapunculus, (see generic history of lobelia, p. 66,) and it was called "Planta Cardinalis," Cardinal plant, by the earliest French.

Parkinson, the first to describe it, calls it, "the rich, crimson Cardinal's flower," stating, "this hath his name in the title, as it is called in France from whence I received plants for my garden with the Latin name; but I have given it in English."

Tournefort (1719) says, "Cardinale, couleur de feu" (Cardinal flower, color of fire). The name is in allusion to the bright, scarlet color of the flowers, which are the same hue as the scarlet hat worn by a cardinal, and not from the shape of the flower. Linnæus adopted this for the specific name of the plant, calling it Lobelia cardinalis by which name it has always been described with the single synonym of Rapuntium cardinalis by Miller.

MEDICAL HISTORY AND PROPERTIES.—Schœpf, 1785,[§] first referred to this plant, describing it as milky and acrid, and posessing properties similar to those of Lobelia syphilitica. It is evident that he knew but little of it.

Barton, 1802,[‖] refers to the Cherokee Indians using an infusion of Lobelia cardinalis, and the powder of the plant, for worms. This is agreed to by Rafinesque, 1830,[¶] who also makes very brief mention of the drug. These statements have furnished the foundation for subsequent writers to class the plant with anthelmintics, as is usually done. However, the Indians made but little use of it, if any, prefering spigelia, and even Prof. Barton gives but little attention to the drug. The plain facts are that absolutely nothing is known regarding the medical action of the plant.

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[*] John Parkinson was an apothecary of London in the sixteenth century when botany was in its infancy. He wrote two very extensive works, which remain to this day as monuments of his preseverance and labor; the first, Paradisi in Sole Paradisus Terrestris, a description of the different species and varieties of plants in cultivation in English gardens and the first work describing and figuring these plants; the second, Theatrum Botanicum, a description of all the then known plants of the world, about 3800.

[†] Paradisi in sole Paradisus terrestris, John Parkinson, London, 1629, page 356 and plate 355.

Described under the name "Trachelium Americarum, flore ruberrimo, sive Planta Cardinalis."

[‡] 1629.—Parkinson Paradisi, p. 356.—Trachelium Americarum flore ruberrimo, sive Planta Cardinalis.

1718.—Ruppius, Flora Jenensis, p. 201.—Cardinalis rivini.

1644.—Columna, Notis et Additionibus ad Rerum Medicarum, Recho.—Rapuntium maximum coccineo spicato flore

1719—Tournefort, Institutiones Rei Herbariæ, p. 163.—Same.

1680.—Morison. Historia Plantarum, part 2, page 466.—Rapuntium galeatum, virginianum seu americanum, coccineo flore majore.

1737.—Linnæus. Hortus Cliffortianus, p. 426.—Lobelia caule erecto, foliis lanceolatis obsolete serratis, racemo terminatrici

1739.—Gronovius, Flora Virginica, p. 134.—Same.

1740.—Royen, Flora Leydensis, p. 241.—Lobelia caule erecto, foliis lanceolatis serratis, spica terminale.

1748.—Linnæus, Hortus Upsaliensis, p. 276.—Same.

[§] Materia Medica Americana, p. 128.

[‖] Collections for a Materia Medica, part 1st, p. 40, and part 2nd, p. xiv.

[¶] Medical Flora of the United States, vol. ii., p. 26.

Constituents.—Prof. William Procter, Jr., 1839,[*] made an analysis of Lobelia cardinalis, obtaining an alkaloidal-like body as follows The herb was dried, macerated with water that had been acidulated with acetic acid, the watery product neutralized with magnesia and then exhausted with sulphuric ether The ethereal solution was evaporated, yielding an aromatic-like oily thick liquid of a brown color It was soluble in turpentine, ether, and alcohol; was of alkaline reaction, neutralized acids, and formed crystalline salts with acids. Its taste was bitter and acrid. This body was doubtless a mixture of an alkaloid with impurities dissolved by the ether. There has been no subsequent analysis.

Lobelia cardinalis is not a commercial drug and is not used in medicine.

SCROPHULARIA.

CARPENTER'S SQUARE

Parts Used—The roots and tops of Scrophularia nodosa, *Linn*, var. marilandica, *Gray*

Natural Order, Scrophularineæ, Tribe Cheloneæ.

Botanical Description—This is a tall herbaceous plant growing four to six feet and found in open shady localities, as along fence rows, and in the border of woods It has a perennial root, hence can be found in the same locality year after year The stem at the base is about half an inch thick, and obtusely angled and grooved as shown in the plate xxxvii. This is probably the reason for calling the plant Carpenter's Square.

The leaves are opposite, ovate or lanceolate, three to nine inches long, acute at the apex, rounded or cordate at the base,[†] and borne on petioles one to two inches long Above they are smooth, dark green color, and beneath lighter and often slightly pubescent. The margins are serrate, in some forms somewhat regular as shown in plate xxxvii, in others they are more cut and irregular.

In August and September the plant produces at the end of each branch a loose, narrow panicle-like cyme of small greenish purple flowers. In development they are truly cymous, the middle flower of each branch of the cyme developing first, and on the same branch we find all stages of advancement from the unopened bud to the nearly mature fruit The branches of the cyme are bracted at each division by a small setaceous bract, and they bear minute glandular hairs, each, as is seen under low magnifying power, tipped with a knob

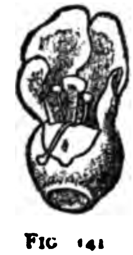

Fig 141

Corolla of Scrophularia nodosa.

The flowers are small, greenish externally, brownish purple within[‡] The calyx has five obtuse, equal lobes, and is closely appressed to the corolla tube The corolla is broadly tubular, nearly globose, and has five segments, the two upper lapping and erect longer than the others, the two side, erect, narrower and shorter, and the lower segment broadly triangular and reflexed Attached to the base of the upper segments is a small

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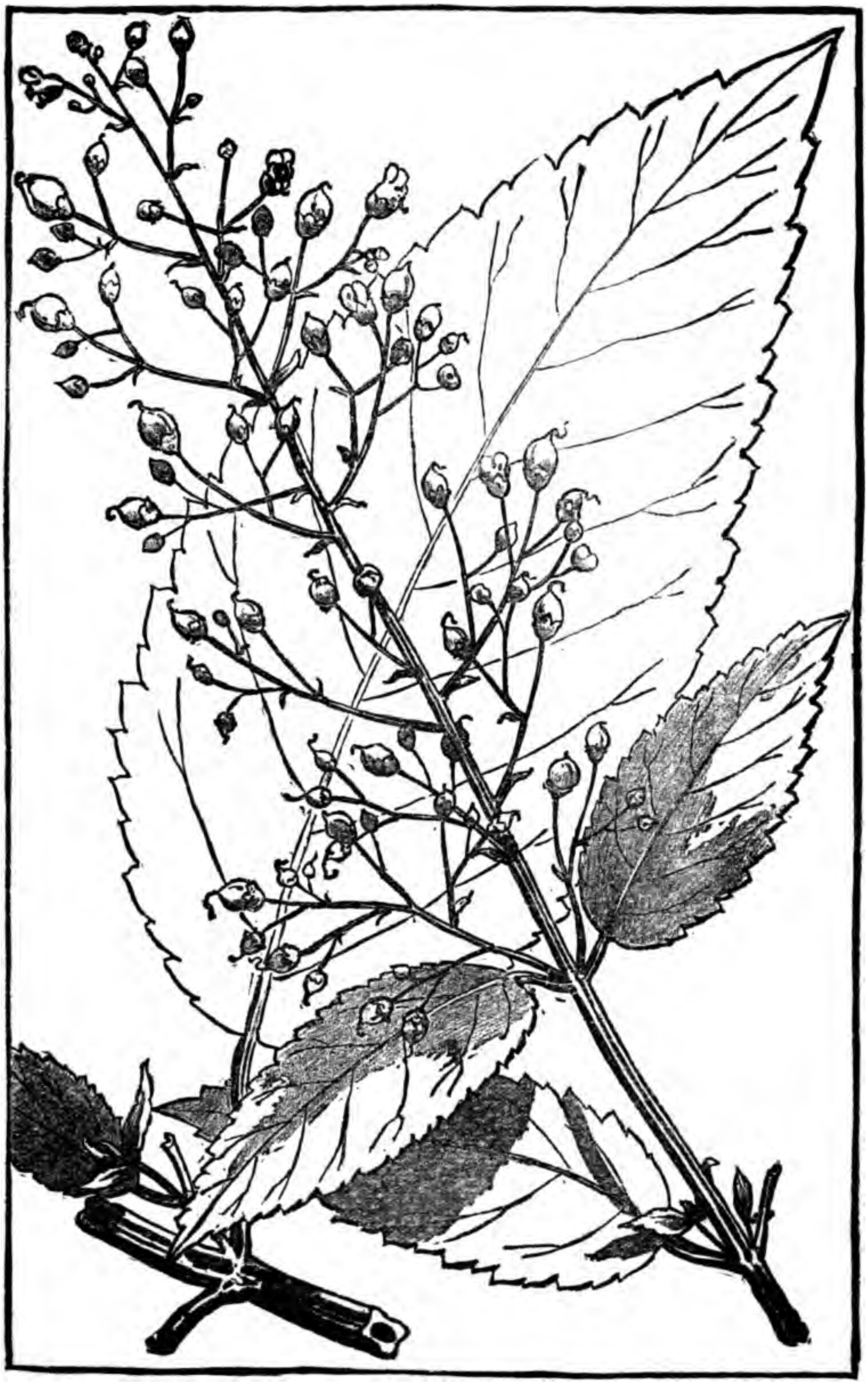
[*] Am. Journ. Pharm., 1839, p 260.

[†] The form shown in our illustration with lanceolate leaves rounded at the base was called Scrophularia lanceolata by Pursh Another form has broader leaves and more cordate base.

[‡] The peculiar color of the flowers is not common, but occurs with other plants, such as Asimina, Calycanthus, etc. Muller accounts for it by the plant, adopting a color suitable to the peculiar tastes of their common insect visitors, the wasps.

PLATE XXXVII.



SCROPHULARIA NODOSA.

(NATURAL SIZE.)

dark colored, triangular scale. This is the rudiment of the fifth stamen, which according to the theory of natural adaption has been suppressed because it is in the way of insects entering the flowers.

The stamens are four and included in corolla tube; the anther cells are confluent and open transversely. The pistil is solitary in the center of the flower and surrounded at the base by a ring-like disk. The fruit is a two celled globose-ovoid capsule, opening at both sides, (septicidal), and containing several triangular, black, rough seed.

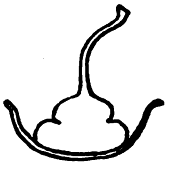


FIG. 142.

Section through the pistil and calyx of a a flower of Scrophularia nodosa, showing disk around the base of pistil.

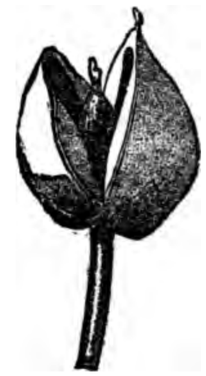


FIG. 143.

Fruit of Scrophularia nodosa. After dehiscence.

In developement the sexual organs are proterogynous, the pistil being developed before the stamens. This is a provision that insures cross-fertilization and the method is worthy of description. When the flower opens none of the sexual organs are visible, but in one or two hours the style, bearing the small globular stigma, unbends and projects from the lower side of the mouth. In this position (see *a*, fig. 145) it rubs the abdomens of insects (which according to Muller are mostly wasps) that visit the flower to get the honey secreted by the disk surrounding the base of the ovary (shown in fig. 142). After being fertilized (by pollen of other flowers rubbed from insects,) and before any of the stamens have appeared the style bends out and is closely appressed to the lower corolla segment, and out of the way of future insect visitors. In this manner young flowers are always fertilized by the pollen of older ones.

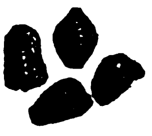


FIG. 144.

Seed of Scrophularia nodosa. Enlarged.

After the fertilized pistil is out of the way the flowers develope the stamens (first the inner two as shown in *b*, fig. 145, afterwards the outer two as shown in *c*, fig. 145) in such a manner as to coat the abdomens of visiting insects with pollen which will fertilize other flowers.*

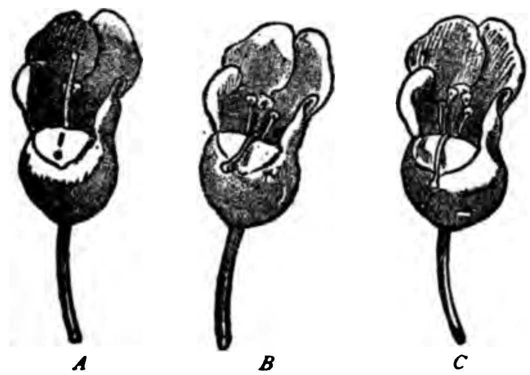


FIG. 145.

Flowers of Scrophularia nodosa, showing three different developements of the stamens and pistils.

BOTANICAL HISTORY.—The genus Scrophularia consists of about a hundred species chiefly found in the Mediterranean regions, and in the Orient. The name is derived according to the "Doctrine of Signature;" the roots of several species having tuberous nodes, it was supposed that the Diety intended them to be used as a remedy for scrofulous swellings, hence called Scrophularia. We do not know who is the author of the name as applied to plants of this genus, but can trace the name back nearly four hundred years to the beginning of the sixteenth century. It was used in 1532 byOtto Brunfels, a German botanist. Tournefort (1719)† first clearly defined the genus, and is usually cited in botanical works as the generic author of the name.

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*Our observations were mostly limited by our convenience to morning (6 a. m.) and at dusk (6 p. m.) but the time taken to develope can be judged by the following:

No. 1.—A flower that opened at noon had the pistil projecting at 6 p. m.; next morning (6 a. m.) the pistil was turned down and one stamen was out; a 6 p. m. two stamens were out; during the second night there was no change, but the third day the last two stamens were developed and the corolla fell.

No. 2.—A flower opened early in the morning; during the day the pistil was developed and turned down; during the night two stamens were exserted; the next day the other two were exserted and the corolla fell.

†Institutiones Rei Herbariæ, p. 166.

The genus at present comprises mostly European and Asiatic plants.[*] In this country the plant under consideration, Scrophularia nodosa is the principle representative, and for a long while was thought to have been introduced from Europe. It extends from Florida to Canada, and from the Atlantic Ocean to Utah, and on the western coast is replaced by Scrophularia californica, a similar plant, with smaller and more sharply cut leaves, formerly classed a mere variety. The only other native species is the Srophularia coccinea of New Mexico, a plant that differs widely from our common species, and from the genus in general in having bright red, showy flowers.

The common American plant is now considered by Gray[†] as a variety (var. marilandica) of the European species, Scrophularia nodosa, *Linn.* It differs in its taller growth (five or more feet instead of two or three,) larger and thinner leaves seldom cordate at the base, more slender pedicels and we may add absence of nodose swellings of the roots.

In Europe the plant is of wide distribution extending over the greater portion of the country. It was described by the earliest writers, (Bauhin, 1623,[‡] and others) as "Scrophularia nodosa fœtida," from the nodose swellings of the roots and its fœtid odor.[§] Linnæus (1753)[‖] in giving it a specific name called it Scrophularia nodosa.

The American plant was first described in 1704[¶] from specimens presented to Sloane by David Krieg.[**] Linnæus (1753)[††] called it Scrophularia Marilandica. Under this name and as a distinct plant it was described by all writers up to 1848, except Michaux, who considered it a variety of the European plant and named it Scrophularia nodosa var americana. In the meantime, Pursh (1814)[‡‡] described as a distinct species under the name Scrophularia lanceolate the form prevailing over the more southern territory with narrower leaves not cordate at the base. This form is the one illustrated in our plate. Throughout all the Eaton Manuals and most of the early American works both these two species were described until united under the name Scrophularia nodosa by Gray, 1848,[§§] who did not consider the plant sufficiently distinct from the European species to be distinguished by name and called the American plant Srophularia nodosa. These views have been adopted by most subsequent writers.

As stated before, however, in his very recent work Gray considers it a variety which he calls var marilandica. We think, however, in adopting these views he should have credited Michaux and used the name that he proposed.

COMMON NAMES.—In the drug trade the plant is generally known by one of the three following names Figwort, Scrophularia or Carpenter's Square.

The first, Figwort is a name handed down from the ancient times of the doctrine of signatures. It is a family name and is applied to all of the genus, and likewise to the Natural Order Scrophularineæ, called "Figwort Order," of which this genus is a type. In our country, Scrophularia nodosa, being the only species used in medicine the name in the drug trade signifies this alone.

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[*] In Nyman's Conspectus Floræ Europææ (1882) there are thirty-seven species given, native of Europe.

[†] Synoptical Flora, vol. ii., part 1, (1878,) p. 258.

[‡] Pinax Theatri Botanici, 1623, p. 235.

[§] This "fœtid odor" mentioned in all European descriptions of the plant, we have not noticed in the American plant.

[‖] Species Plantarum, 1st edition, 1753, vol. ii., p. 619.

[¶] Historia Plantarum, Ray, vol. iii., (supplementary) p. 399. Under the name "Scrophularia marilandica, longo profunde serrato Urticæ."

[**] David Krieg was a German botanist, who with Wm. Vernon came to this country in 1663 and on their return to Europe carried back a small collection which was presented to Sloane and by him given to Ray and was described in third volume of Ray's History of Plants (1704). The vessel that brought over these two travelers carried also Banister, (see note † page 26) and it is no doubt due to him that their attention was drawn in this direction, if indeed it was not Banister's plants (as is stated by Pickering) that were given to Sloane. Ray, however, gives Krieg and Vernon all the credit for the collection and does not mention Banister's name. Neither of these travelers wrote any thing on the subject of botany, nor indeed seem to have been workers in the science, yet they are commemorated by the two American genera Kriegia and Vernonia.

[††] Species Plantarum, 1st edition, 1753, vol. ii., p. 619.

[‡‡] Flora Americæ septentrionalis, vol. ii., p. 419.

[§§] Botany of Northern United States, (since known as Manual) 1st edition, p. 297.

The origin of the name has no reference to "figs." In the olden times the plant, because it has swellings on the roots, was used on the doctrine of signatures in the disease called *ficus*, hence, it came to be known as "figwort." Ranunculus Ficaria was called the same from a like reason.

In a similar manner the names Scrofula Plant and Scrophularia were given to it upon the belief that the Creator had indicated by giving it knotty tubers that the plant was good for Scrofulous glands. We find the name used by Borrich in 1690 and it has been the generic name from the first.

The name Carpenter's Square is the one commonly used by Eclectics, but rarely in purely botanical works, or by the Regular Profession. Its derivation is not so plain. Presumably it is from the square stem of the plant, but this is not certain, as the stem while square in outline has rounded edges, and squareness would not probably give it a name when there are other common plants, such as Lophanthus nepetoides with sharp-angled square stems to which the name is never applied. We do not know who first called the plant by this name, probably in early domestic medicine, from confusing it, under the name "Brownwort," with Brunella vulgaris, which was called in olden times Carpenter's Herb because its corolla has the form of a bill-hook, and hence, was supposed to cure wounds from edge-tools.

There are a few other names applied in old English works to the plant, never used now, and we mention them merely for completeness. Great Pile-wort, Kernel-wort, Knotted-root, all applied from the swellings on the roots; Murrian Grass, Stinking Christopher, Bull-wort a corruption of Pool-wort from growing in damp places; Brown-wort, a German name, the plant now being called by the Germans *Braunwurz*, from the brown color of the stem and leaves, probably not originally applied to Scrophularia, but to Brunella vulgaris.

COMMERCIAL HISTORY.—Both the herb and root of scrophularia are found in commerce, and in making compound tincture of corydalis, are employed in mixture. Ointment of scrophularia is made of the fresh leaves. There has been a limited demand for this drug since 1848, but it has never been of great commercial interest and doubtless will not become important.

DESCRIPTION OF THE DRUG.—As found in commerce there are two drugs, consisting of the roots and of the tops of the plant. There is considerable demand for the roots, and, but little for the herb.

The root is perennial, and as those that grow in one season live through the next and then decay, the commercial drug shows two years' growth, and the roots of each can plainly be distinguished by appearance. The root is woody, hard, and ligneous. When dry it is a dark, ash color, and wrinkled longitudinally in consequence of the unequal contraction of the herbaceous portion in drying.

If gathered in early spring, the fresh root is of a watery, translucent consistence, covered with light brown skin. Attached to the drug of commerce are found the lower portions of the stems, which the root gatherers cut off an inch or two above the roots. These are of a hard, firm texture, almost woody and show the peculiar quadrangular shape, which is seen in our drawing of the plant.

As described in our botanical portion, the root of the European plant forms nodular swellings, but they are entirely absent as far as we have observed in our native plant.

The herb of commerce consists of the dried leaves and flowering tops. It can be identified at once by the presence of immature capsules which have been figured and described in our botanical portion.

CONSTITUENTS OF THE ROOT.—The botanical relationship of this plant and its resemblance in some respects to those that like digitalis yield active alkaloids led us to hope that its consideration might lead to interesting results. In this we have been disappointed, and, we think that it may be safely accepted that the American Scrophularia is not characterized by a constituent of interest to the therapeutist or chemist.*

The European species of Scrophularia were analyzed by Walz,† and although two substances, obtained from Srophularia nodosa and Scrophularia aquatica, were named respectively scrophularin and scrophularosmin, neither proved of interest. Walz was induced to examine the European plants from their relationship to digitalis, thinking to find an alkaloid related to digitaline, but was disappointed. The American plant had not been analyzed previous to our examination which follows.

Alcohol extracts from the root all the sensible characteristics. The residue consists simply of woody matter and the ordinary constituents of plants. The alcoholic liquid has a yellowish brown color, only the odor of alcohol, and a slightly pepper-like taste.

Alkaloid.—The alcoholic tincture was acidulated with acetic acid and then evaporated, with the addition after it reached a syrupy consistence of as much water as the bulk of the original tincture; a greenish oleoresin separated after cooling. After a day had passed the aqueous liquid was filtered. It was nearly odorless, had a reddish brown color and an insipid, herby taste. It gave precipitates with alkaloidal reagents and perceptibly with dilute ammonia water, but the precipitate dissolved in excess of this alkali. The liquid containing this precipitate was shaken with sulphuric ether when it dissolved and was obtained from the ethereal layer by evaporation.

In consequence of the fact that it existed in very small amounts, we failed to purify it, but observed it in sufficiently pure condition to assert that it is white. From ten pounds of the root we obtained enough to determine that it forms very soluble salts with the ordinary acids, and is itself soluble in an excess of water. It is odorless and quite or nearly tasteless. We failed to crystallize either the alkaloid or its salts, owing to the small quantity obtained, but we see no reason to doubt the feasibility of crystallization in larger amounts. The very small proportion in which this alkaloid exists forbids the idea that it can ever be of any importance. We do not assume to affix a name or attempt to distinguish it from other alkaloids. The other constituents of the aqueous liquid are glucose, gum, mucilage, and ordinary plant constituents.

Fixed Oil.—The tenacious oily-like substance that remains within the filter paper after separation of the foregoing aqueous liquid, consists about one-half of a greenish colored fixed oil, that was obtained by extracting this residue with benzol, filtering and evaporating the benzol. The product was lighter than water, of a fatty odorand oily taste, that was destitute of bitterness or pepper. It freely dissolved in ether, alcohol, carbon disulphide and benzol, and refused to crystallize or deposit crystals. It is unimportant.

Resin.—The substance remaining as a residue from the benzol is a dark brown resinous body, insoluble in water, but freely soluble in alcohol. It is an impure resin and was obtained by extracting this brown mass with chloroform, filtration and evaporation of the chloroform solution. It has a yellowish brown color in thin layer and imparts a yellowish brown color to alcohol, and is the most characteristic substance of the drug.

This resin is uncrystallizable, and of a distinct peppery taste when chewed, and is sharply peppery from alcoholic solution.‡ Nitric acid dissolved it, forming a yellow solution and evolving the usual red fumes if heated with it.

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*Some may argue that as the European species is known to be free from active constituents, this may be accepted also. We believe that such a view is not supported by the investigations of plants of the same same species in different locations, although, certainly the native American Scrophularia has not developed an alkaloid, and climate and soil have not given it a peculiar principle.

†American Journal of Pharmacy, 1863, p. 295, from N. Jahrbuch, f. d. Pharm. Band xxvi., p. 296; xxvii., p. 12.

‡It may be compared with the resin of ginger, but is not acrid to the throat and fauces like that substance The sensation produced is mostly on the tongue.

Hydrochloric acid in contact with a thin layer of the resin that was deposited from alcoholic solution on porcelain, changed it to reddish brown, and finally purple, but did not dissolve it.

Sulphuric under like conditions immediately became rose colored, then reddish purple, and unless the resin was in too great amount remained of that color. Upon gently heating this solution in sulphuric acid it assumed a dark red color. This sulphuric acid reaction together with the sensible properties of the resin seem sufficient to characterize Scrophularia root, for we do not know of another resin of a pure pepper taste and soluble in chloroform that reacts in this manner. A study of the decomposition products and endeavor to establish the formula of this resinous substance was not attempted, as it did not promise to be of any value in therapeutics.

The other constituents were those ordinarily found in plants and unimportant.

CONSTITUENTS OF THE HERB.—The herb of commerce consists of the leaves and immature capsules with fragments of the stem. It has a greenish color, herby odor and mucilaginous, slightly astringent taste. It yields chlorophyll, fat, an abundance of mucilage and the ordinary constituents of plants. The characteristic principle is the mucilage which was obtained by simple digestion with warm water. It is soluble in diluted alcohol, and upon evaporation of a fluid extract of the herb, mixed with twice its bulk of water, filtration and cooling, it becomes ropy, like mucilage of quince. This mucilaginous substance doubtless is the useful principle in poultice, and, hence the value of the bruised leaves in this manner. The herb gave no indications of an alkaloid or definite constituent that promised to be of physiological interest.

PHARMACEUTICAL PREPARATIONS.—The first edition of King's Dispensatory* gives formulas for making three preparations that contain scrophularia, and they are continued in succeeding editions as follows:

Compound Syrup of Rumex.—(Scrofulous Syrup).

Take of Yellow Dock root, two parts; False Bittersweet, one part; American Ivy bark, Scrophularia leaves and root, of each, one-half part. Grind the drugs together; percolate with a mixture of water, three parts, and alcohol, one part, until eight parts of percolate are obtained; in this dissolve sugar enough to bring to sixteen parts, all by weight.†

The dose of the above, according to Prof. King, is from one to four fluid drachms, three times a day, and is used in scrofulous affections and cutaneous diseases.

Compound Tincture of Corydalis.—(Scudder's Alterative).

1st. Take the roots of Turkey-corn, Yellow Dock, bark of Tag Alder, and leaves and roots of Scrophularia, of each, one part; all in powder. Mix them together and percolate with alcohol, obtaining ten parts of percolate.

2nd. Take of Mayapple root in coarse powder, one part; moisten with hot water; allow to stand one hour and then transfer to a percolator. Use hot water as a menstruum and obtain four parts of percolate. Dissolve four parts of sugar in this percolate, add the solution to the previously obtained tincture, and then enough syrup to bring to twenty-four parts.

This preparation was once used by Prof. Scudder, who has long since discarded it. He stated to us recently that he considered that scrophularia was a very feeble remedy, and, doubtless he concocted this mixture during his early day after the custom then prevalent. It was employed after the manner of compound syrup of rumex and in the same dose. It is needless for us to call attention to the fact that in both of these preparations the polypharmacy destroys all trace of the individuality of scrophularia.

Ointment of Scrophularia.

Take of green scrophularia leaves, one-half part; lard, one part; tallow, half a part.‡ Mix them together and heat over a fire until the water is expelled from the leaves and they are crisp. Then strain while hot. This produces a green ointment of a rank odor "used in piles, painful tumors, ulcers, and cutaneous diseases."—*Am. Disp.*

MEDICAL HISTORY AND USES.—The use of this plant in medicine dates from an early period of European medical history. Not from a physiological investigation, nor from domestic practice, but from the doctrine of signatures.§ The European plant has little tubercles upon the root, and their resemblance to swellings, indicated to the physicians of former times an adaptation to the cure of such kinds of human ills, and thus the plant came into use. Boerhaave extoled it highly, and we may say, his recommendation reached the modern day. Thus, the New Dispensatory, London,‖

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*The Eclectic Dispensatory of the United States of America, 1852.

†The working method is our own. The process in the American Dispensatory is impracticable.

‡The proportions differ from the formula of King. Experience teaches us that it is necessary.

§See volume i., p. 48.

‖New Dispensatory, London, 1770, p. 125.

states that, "The roots consist of slender fibers, with some little tubercles among them, which are supposed to resemble the hemorrhoids; from whence it has been concluded, that this root must needs be of wonderful efficacy for the cure of that distemper."

This record perhaps introduced the American plant, but, it is not freely employed. Schoepf, 1787,[*] briefly noticed the plant, stating that the leaves were possessed of a fetid smell resembling elder and that it was useful in healing wounds. Rafinesque, 1830,[†] reproduces Schoepf's remarks, and states that the leaves make a good poultice that is much used in New England. Barton, however, neglects the plant.

The early "botanics" used it somewhat, but not enough to commend it to such men as Ewell, Thompson, Hand, Beach, and other pioneers of the Eclectic and Thompsonian sects, who make no mention of it. Prof. John King, however, 1848,[‡] gave it a position and also formulas for preparations containing it, since which we occasionally find persons who favor its employment in medicine. The United States Dispensatory, 1833, gave it an unimportant position, which is still retained. The medical claims of the drug are written for this publication by Prof. Hale, of the Homœopathic school, and Prof. Goss, of the Eclectic school, the latter of whom is a strong advocate of the drug.

We could not find a member of the Regular school that employed it, and, as we could not obtain a characteristic proximate principle we did not interest Prof. Bartholow in a physiological examination.

THE USES OF SCROPHULARIA IN THE ECLECTIC SCHOOL OF MEDICINE.—(Written for this publication by I. J. M. Goss, A.M., M.D.)—This drug has not been thoroughly investigated, but is doubtless worthy of a more prominent place in the Materia Medica. Its action mainly is upon the blood and glandular system, especially the lympathic glandular system. It is one of those remedies under the old classification, which was denominated alterative or catalytic. Although unknown to the profession at large, yet it is certainly a very valuable remedy in its proper place.

The drug is valuable in that peculiar condition known as struma, in all its varied forms. In chronic cutaneous diseases, applied externally and given internally, it is of material service in affording relief. In cases where the fluids and solids are so depraved that there is a great tendency to downward metamorphosis; and the limbs or skin anywhere ulcerate whenever contused, then scrophularia comes in as a very appropriate remedy. It is also applicable in tertiary syphilis. It has been highly praised in menstrual irregularities or obstructions—I have not tested it in the last named trouble, but there is not wanting of very respectable evidence to the statement.

In over-doses it is said that it produces vomiting and purging. It certainly exercises a direct influence over the glandular and cutaneous system, restoring the normal functions, promoting absorption of foul and amorphous deposits, and aiding the reparative process. It acts upon all the excretory organs, thereby greatly increasing waste. It undoubtedly acts with as much certainty as any of our waste-promoting vegetable remedies, removing the amorphous materials that accumulate in the system in certain diseases. Not only do we find it to thus act well in tertiary syphilis, struma and scrofula, but anywhere where there are such morbid materials accumulating in the blood as are of too low vitality to enter into organic tissues of the body.

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[*] Materia Medica Americana, 1787, p. 99.

[†] Medical Flora and Botany of the United States, vol. ii., p. 262.

[‡] The Eclectic Dispensatory of the United States of America, p. 370.

It is used systemically and locally in hemorrhoids by some, and it is said with success. One of its first uses was in itch, which, it is said, it cured quickly under local application.

Scrophularia is one of those positive anti-scrofulics, which, increasing excretion and elimination from the blood, also possesses the power to remove the cacoplastic material from the system. It doubtless has much influence over the assimilative organs, aiding the elaboration of plastic materials to build up the broken down tissues. It acts beneficially in all that class of diseases that resemble scrofula or struma. It is a remedy for many skin affections in which it may be used locally and systemically. It requires patient perseverance to get its beneficial effects, and that is the case with all catalytics or alteratives.

The dose is from 30 to 60 gtts. of the fluid extract.

Indications for Scrophularia.—Cases in which children have ulceration about the ears, or face, nose, or eyes, and where they are inclined to ulceration of the skin when abrasion is produced, and in that perverted nutrition, recognized as struma, with its entire list of morbid phenomena, scrophularia may be thought of at once. In children whose neck, marred with cicatrices of scrofulous ulceration, in those whose lymphatics are enlarged, and also, in that little sprightly precious one who complains of his hip or knee, is this remedy directly indicated. In that little one, with full-lipped pink and white countenance, with fullness of the ala of the nose, it is also directly pointed out as the remedy par excellence. In children, where the epiphyses are thickened, and the joints are unusually full, scrofula is threatened, and this remedy is indicated.

In fact, the strumous diathesis in all its varied shades requires a remedy like the one under consideration, that has the power to correct the secretions and excretions. This remedy can be alternated with the iodides and such other remedies as may be indicated in each individual case.

THE USES OF SCROPHULARIA IN THE HOMŒOPATHIC SCHOOL OF MEDICINE.—(Written for this publication by Edwin M. Hale, M. D., Emeritus Professor of Materia Medica and Therapeutics in the Chicago Homœopathic College.)—Scrophularia was once highly esteemed as a medicine, but has fallen entirely into disuse during the last century. Old Culpepper writing in 1800, says, it is under the dominion of Venus, "an excellent remedy for king's evil, for bleeding wounds, knots, kernels, wens, piles, hæmorrhoidal tumors, etc. It drieth up the superfluous, virulent moisture of hollow and corroding ulcers, and taketh away redness, spots and freckles in the face, and also the scurf and blotches therein."

Later writers have not added much more to this list of disorders. It is now used in domestic practice for nearly the same things.

It was not used in Homœopathic practice until 1886, when it was proved by W. H. Blakely, M. D., then of Princeton, Ky.* He says, it was then used in country practice by nurses, for external inflammation, boils, old indolent ulcers, abrasions, wounds of all kinds, causing a quick and healthy granulation. He says: "I have found it equal, if not superior, to calendula, arnica, or any other topical application."

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*North American Journal of Homœopathy, p. 187.

The provings caused symptoms resembling arnica, bryonia, nux vomica. Blakely thinks it occupies a place between rhus and bryonia. This proving, together with a fragmentary one, translated from the German is to be found in "Allen's Encyclopœdia Materia Medica. Many of its symptoms remind me of digitalis, which belongs to the same botanical family. Some German homœopaths claim to use it successfully in obstinate cutaneous diseases.

The heart symptoms I allude to are "weakness and oppression in the epigastric region. Upon turning on either side violent dyspnœa, increased secretion of urine, a feeling of constriction of the chest, an indescribable sensation in the region of the heart, with severe palpitation, beating so loud that it could be heard at the distance of several feet."

The congestive morning headache caused by the drug is intense and accompanied by nosebleed and vertigo. Some of the symptoms point to congestion of the liver, with bilious or catarrhal diarrhœa.

These symptoms were produced by doses of 10 drops of the crude tincture, three times a day; in all two ounces were taken.

MEDICAL AND PHARMACEUTICAL REFERENCES TO SCROPHULARIA.*

1753.—The New Dispensatory, p. 204, (and other editions).

1762.—Histoir des Plantes, Vol. I., p. 422.

1787.—Materia Medica Americana, Schoepf, p. 99.

1802.—Medical Dictionary, Quincy, p. 262, (and other editions).

1820.—Medical Dictionary, Hooper, p. 798.

1830.—Medical Flora of the United States, Rafinesque, Vol. II.. p. 262.

1830.—The Botanic Physician, Elisha Smith, p. 508.

1831.—The American Dispensatory, Coxe, p. 625.

1833.—United States Dispensatory, Wood & Bache, p. 577, (and subsequent editions).

1736.—Improved System of Botanic Medicine, Howard, Vol. I., p. 292, (and other editions).

1838.—Flora Medica, Lindley, p. 502.

1844.—Medicines, Their Uses and Mode of Administration, Neligan, (Revision of Reese), p. 315, (and other editions).

1846.—Materia Medica and Therapeutics, Pereira, Vol. II., p. 305, (and other editions).

1847.—Materia Medica and Therapeutics, Royle, (Carson's Revision,) p. 490, (and other editions).

1847.—The American Practice, Beach, p. 689.

1848.—Mayne's Dispensatory and Formulary, (Revision of Griffith,) p. 242, (and other editions).

1848.—Christison and Griffith's Dispensatory, p. 856.

1848.—Medicinal Plants of New York, Lee, p. 41.

1850.—Medicinal Plants of the United States, Clapp, p. 825. (In Report of the Am. Med. Assoc.).

1852.—Eclectic Dispensatory of the United States, King and Newton, p. 370, (and subsequent editions).

1872.—Pharmacopœa Homœopathica, Polyglotta, p. 219.

1878.—Dispensatory and Pharmacopœia, Buchanan and Siggins, p. 256.

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*All the early European publications as well as the American prints of the early part of this century that considered medicinal plants recognized this herb. It will be noticed that we here refer to some of the American domestic publications that we do not name in our medical history, the reason being that they add nothing that is new.

LINDERA BENZOIN.

SPICE BUSH.

Parts Used.—The bark and berries of Lindera Benzoin, *Meisner.*

Natural Order Laurineæ, Tribe Litseacæ.

Common Names.—It is natural for settlers in a new country to exagerate the virtue of the natural products of the land, and hence it is that this bush was described by early travelers as being exceedingly aromatic and fragrant, and was said to be a substitute for allspice, and came to be known as Spice Bush, Wild Allspice and Spicewood, the former being the name by which it is generally designated.

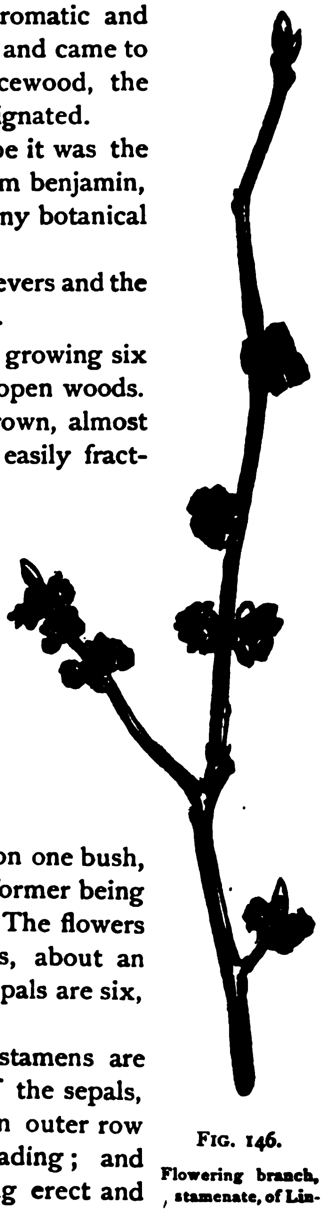

Fig. 146.
Flowering branch, stamenate, of Lindera Benzoin.

When the shrub was first introduced into Europe it was the reputed source of the gum benzoin, also called gum benjamin, and the shrub is still named Benjamin Bush in many botanical works.

The twigs have been used in domestic practice in fevers and the plant is known also as Fever Bush and Fever Wood.

Botanical Description.—Spice bush is a shrub growing six to ten feet high, and found along streams and in open woods. The branches are covered with a smooth, dark brown, almost black, thin bark. They are slender, tapering, and easily fractured.

The flowers appear before the leaves, and from lateral buds situated in the axes of the leaf scars of the previous year. There are one or two flower buds produced in each axis. Each flower bud develops usually three, sometimes more, small yellow flowers, the middle one developing first. The bud scales remain attached at the base of the flower, forming an involucre; the outer two, concave, brown and boat-shaped; the inner thinner, larger, and greenish yellow.

The plant is dioicious, bearing stamenate flowers on one bush, the pistillate on another, the former being of more frequent occurence. The flowers are on short yellow pedicels, about an eighth of an inch long. The sepals are six, yellow, spreading or reflexed.

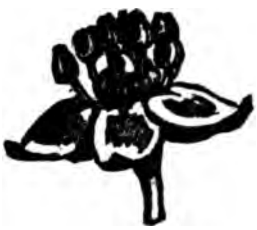

Fig. 147.
A stamenate flower of Lindera Benzoin.

In the male flower the stamens are nine, and about the length of the sepals, and are in two rows; six in an outer row opposite the sepals and spreading; and three in an inner row standing erect and opposite alternate stamens of the outer row. The three inner stamens have attached at the base, on each side, a deep yellow glandular ap-

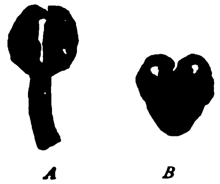

FIG. 148.
A, stamen after dehiscing; *B*, a gland from inner stamen of Lindera Benzoin.

pendage, (see *b*, fig. 148,) which forms a kind of crown in the centre of the flower. These are in reality the abortive anthers of a suppressed row of six stamens, but they have lost almost all their anther character.

The filaments are slender and bear a two-celled anther. These anther cells open toward the centre of the flower by two valves, hinged at the top which shrivel up and remain as shown in our figure.* The pollen is dry, dusty, and readily dissipated by the wind so that soon after dehiscing none remains in the anther cells. The grains are small, .06 Mm., and simply globular, without special marking, excepting a granular coat. The pistil in the male flower is represented by a minute, rudamentary organ in the centre of the flower.

The fertile flowers are similar to the stamenate, but smaller and more numerous in the cluster. The calyx is not as spreading, but cup-shape and encloses a yellow pistil with a globular, one-celled ovary and a slender protruding style. Around the base of the pistil are inserted about eighteen small rudimentary stamens.

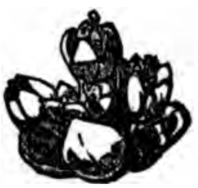

FIG. 149.
A cluster of pistillate flowers of Lindera Benzoin.

The leaves are oblong-obovate, three to five inches long, one-half as wide, entire, thin, smooth except a slight pubesence on the veins, acute or acuminate. They are dark green above, lighter beneath.

The fruit is a fleshy drupe, containing a bony seed, covered with scant flesh, and a smooth skin, which when ripe, in the latter part of the summer, is of a bright red color.

There is but one other species of the genus in the United States. This is Lindera melissæfolia, and is found in the Southern States.

COMMERCIAL HISTORY.—The plant is so little used in medicine that it has no commercial history. There is a limited demand for a fluid extract which is made from the bark of the branches and from the twigs, but they are collected in small amounts and usually to order.

CONSTITUENTS.—All parts of the plant are pervaded by a volatile oil that has an aromatic odor, and the berries when ripe contain a fixed oil in addition thereto. The volatile oil is the characteristic principle, but it promises nothing in medicine beyond other well-known and more abundant aromatic or stimulating oils, such as sassafras, erigeron, turpentine, hemlock, etc.

Schoepf, 1787, mentions this expressed oil of the berries, and all writers have referred to the aromatic property dependent upon a volatile oil. The first systematic examination of the drug that we can locate was made by Mr. T. Morris Jones,† who found the bark to yield a volatile oil of an aromatic odor; and the usual constituents of plants, such as a small portion of resin, wax, starch, a tannin and inorganic constituents. He did not determine the specific gravity or the boiling point of the oil, but found that by means of bichromate of potassium and sulphuric acid, or permanganate of potassium, the odor of bitter almonds could be divulged. He concluded therefrom that the oil belonged to the cinnamyl series.

Mr. Perry Martin Glim, 1875‡ examined the dry berries, and by exhausting them with petroleum benzine obtained nearly fifty per cent. of a deep red oil of an aromatic taste and odor.

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*The valvular dehiscence of the anther, which is comparatively rare, is a family character of the entire Natural Order Laurineæ, and occurs in all the genera.

†American Journal of Pharmacy, 1875, p. 246.

‡An inaugural essay, American Journal of Pharmacy, 1875, p. 300.

This was a mixture of fixed and volatile oils, the larger share being fixed. The red color was undoubtedly due to the coloring matter of the berries, and is not inherent in the oil, although he did not determine that fact. The specific gravity of this oil was 0.925. This is probably identical with the expressed oil mentioned by Schoepf. Mr. Glim distilled the fresh berries with water, obtaining thereby about five per cent. of a colorless volatile oil of a pleasant fragrant odor, and the specific gravity, 0.870, but he did not attempt to verify the examination of Mr. Morris regarding its relation to the cinnymal series. The chemical study of this oil would be interesting to students, but does not promise much in the direction of an application to medicine.

MEDICAL HISTORY.—Under the name "Fever Bush," Cutler[*] briefly describes an aromatic laurel with red berries, a decoction of the twigs of which was used by country people as a drink in low fevers. He states that the Indians also used it. This is the first reference we can find to the medical uses of the shrub.

Schoepf, 1787,[†] describes this plant under the name Laurus æstivalis, and his description of its qualities is equal to any that has succeeded unto the present day. Indeed, we are of the opinion that subsequent medical writers have simply altered the wording of this paper of Schoepf that was printed one hundred years ago. At least, they have added nothing thereto, and, if our surmise is correct, Schoepf has received at their hands but little if any recognition. The credit that has since been occasionally awarded other parties should undoubtedly go back of them to Schœpf. He states that the leaves in decoction are used in intermittent fever, and that the expressed oil of the berries is applied externally for rheumatism.

Barton, 1801,[‡] briefly stated that during the Revolutionary War the Americans used the dry berries of this plant as a substitute for allspice, and also upon Cutler's authority said that a decoction of the young twigs was also used by country people as "an agreeable drink in slow fevers." The fact that Barton passes the plant so lightly fairly proves that it was not even in moderate use in his day; and, in our opinion, it would require a lively imagination to trace a simularity between allspice and the berries of spice-bush, or to make the decoction of spice-bush agreeable.

Rafinesque, 1830,[§] gives the plant an inconspicuous position, and states, apparently on the authority of Schoepf, although he makes no immediate reference to that author, that it is "used in tea or powder, chiefly as a stimulant and depurative, also as a tonic and vermifuge. It is a good febrifuge in agues. The red berries afford a fine stimulating oil."

The first edition of the United States Dispensatory (1833) omitted it, but in the apendix of the second edition (p. 1091, 1834) a few lines recognize it in a general manner as unimportant. To this record nothing has been added in after editions beyond brief reference to the chemical papers that appeared in the American Journal of Pharmacy (see Constituents).

King, 1852,[‖] in the first edition of his Dispensatory, mentions the plant ascribing to it the usual properties, but this was altogether upon the statements of others, and Prof. King has never considered it of interest sufficient to prescribe it.

Neither Beach, Thompson, nor their followers, have used it as a materia medica remedy, although occasionally country people were directed to drink a tea of the shrub for fevers. It is asserted by some that a tea of the berries is beneficial in dysentery, and, upon the authority of Rafinesque, that a decoction of the bark will expel worms in children, but we can find no good reason for employing this drug for these purposes in the presence of other well-known and common valuable remedies. Taken altogether, the drug is unimportant, and only under cases of necessity similar to the pressure of war, will it be likely to excite any attention; but under such circumstances it possibly might again be used as a substitute for substances that are temporarily unattainable.[¶]

Dose.—Writers agree that infusions of all parts of the plant are given freely, but it is probable that the medical profession know of it only by reports of country people.

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[*] "An account of some of the vegetable productions naturally growing in this part of America, botanically arranged, by the Rev. Manesseh Cutler." Published in the Transactions of the American Academy of Sciences, 1785, p. 440.

[†] Materia Medica Americana, p. 61.

[‡] Collections for a Materia Medica, part 1st, p. 20 (edition 1810).

[§] Medical Botany of the United States, volume ii., p. 236.

[‖] Eclectic Dispensatory of the United States, King and Newton, p. 94

[¶] During the late civil war in America, the expense of coffee was so great as to prevent many persons from enjoying that luxury. Then substitutes appeared, and one that country people employed extensively was roasted rye. By stretches of imagination these decoctions could be made to appear palatable, but, when attainable again, the genuine coffee proved very acceptable. This is not given upon hearsay, but by experience.

DIPHYLLEIA CYMOSA.

UMBRELLA LEAF.

Parts Used.—The rhizomes of Diphylleia cymosa, *Michaux*.

Natural Order Berberideæ, Tribe Berbereæ.

Botanical Description.—This plant is rare, and found only in rich, wet soil along the Alleghanies in the Southern States. It has a very close resemblance to the common Mayapple (Podophyllum peltatum), and its resemblance to this plant induced us to consider it, expecting to find similar medical properties. It is quite naturally called Southern Mayapple, but we would not encourage the name after having found it has no medical properties in common with that plant, and hence, have given as the common name, Umbrella Leaf, which is usually given in botanical works.

The plant grows one or two feet high, and has two leaves somewhat similar to those of Mayapple, but alternate instead of opposite. When mature they are a foot or more in diameter and binate, having a deep rounded sinus. The margins are lobed and toothed.

The flowers appear in May in a terminal umbelliform cyme. They are white, six petaled, six stamened, and with a solitary, one-celled pistil. The six sepals are caducous, falling as the flower expands.

The fruit is a globular blue berry, containing two to four seeds.

Botanical History.—The plant was first discovered by the elder Michaux, in the year 1786, and described and illustrated with two plates (very good excepting the rhizome) in 1803.[*]

He named it Diphylleia cymosa,[†] and the plant has been fortunate enough to escape all synonyms.

It was introduced to English horticulturists about 1812 and illustrated in Botanical Magazine (plate 1666) in 1814.

The genus Diphylleia consists as far as known of this species alone which is found in this country only in the mountains of the Southern States, but has been discovered also in the mountains of Japan.

Description of the Drug.—The rhizome of Diphylleia is knotted and marked with large scars. Each year the plant sends up a new stem, and the old one dying off leaves a large seal-like scar, hence, each scar represents a years growth. The rhizome differs from most others in the fact that the scars are almost contiguous and that the internode of a years growth is very short.

The roots are numerous, fleshy, long, and proceed from the under portion of the rhizome.

The dried rhizome is brittle and of a light brown color externally. It is not an article of commerce, there being no demand for it.

Constituents.—The dried rhizome was powdered and extracted with alcohol by percolation. The percolate was evaporated to a syrupy consistence and poured into cold water. A resinous material separated, of a bitterish acrid taste, resembling resin of podophyllum, but less bitter and of a more persistent acrid senega-like after-taste. The odor of this resin was less intense than that of resin of podophyllum but similar to it. It resembled that drug in color and in characteristics, nearly enough to be confused with it. Clinical investigations demonstrated, however, that it possessed no action similar to resin of podophyllum, and does not have any other medicinal property, owing to which fact we considered it unnecessary to examine it in detail. This resinous body was of complex nature, and was the characteristic constituent of the drug. Careful investigations demonstrated that no trace of an alkaloid or other interesting constituent existed in the plant.

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[*] Flora Boreali-americana, Andreas Michaux, Paris, 1803, volume 1, page 203, plate 19 and 20.

[†] The generic name is from the Greek δις, twice, and φύλλον, a leaf from the constant two lobed leaves. The specific name is from the cymous flowers.

Medical History and Properties.—Prof. B. S. Barton[*] preceeding ourselves had educed from the relationship of this plant that it would have properties similar to podophyllum and he writes, 1798:[†] "I have not been able to collect a sufficient quantity of this to ascertain its powers; but judging by the taste and smell, which it must be confessed are sometimes fallacious tests, I suspect its root possesses the virtues of Mayapple."

As is shown by the following investigation this view is erroneous. From that date to the present this plant escaped attention. It was not employed by the medical profession, nor has it been used in domestic medicine, and, excepting by our review is doubtless unknown to the physician or pharmacist.

Clinical Investigation.—This was instituted in the Clinic of the Miami Medical College, of Cincinnati, by Dr. C. R. Holmes and in the Cincinnati Hospital by Prof. T. H. C. Allen, M.D. It was shown that in doses increased from three minims of the tincture once a day, to three fluid drachms three times a day, it exerted no action other than would be obtained from the alcohol present. It did not effect the respiration or temperature and did not act in the least degree as a cathartic or laxative. The resin also proved inert. In connection with the botanical relationship of the plant and the simularity in physical and other properties of its prominent constituent to the active similar substance obtained from the closely related Podophyllum peltatum, these facts are unexpected. It may be safely accepted that Diphylleia cymosa will never become prominent in medicine because of the value of any well defined constituent as we now view drugs and drug action.

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[*] Benjamin Smith Barton was born in Lancaster, Penn., February 10, 1766. His mother died when he was eight years, and his father when he was ten years of age. He was then cared for by a family friend and at an early age exhibited a studious disposition and a love for natural history and drawing. In 1782 he was taken to Philadelphia, resided in the family of his elder brother, attended college and studied anatomy under the then celebrated Dr. William Shipper, with whom, when eighteen years of age, he began the study of medicine. In 1785 he formed one of a party of commissioners under David Rittenhouse to locate the western boundary line of Pennsylvania, and here applied himself to botanical studies, and the uses that the Indians made of medicinal plants. In 1786 he went to England and studied medicine in the University of Edinburgh, attaining some distinction, and taking the Harveian prize, 1787, the subject being Hyoscyamus niger. That year he issued from London his first publication "Observations on some parts of Natural History, to which is prefixed an account of some considerable vestiges of an ancient date, which has been discovered in different parts of North America." In 1789 he left Edinburgh University because of a dislike for two of the professors and went to Gottingen, Germany and graduated from the University founded by George II., and then returned to America. Upon his return, the trustees of the College of Philadelphia instituted a chair of Natural History and Botany electing Barton as lecturer. He was made professor of that department after the incorporation of the college with the University of Pennsylvania (1791) holding the place until his death. In 1795 he accepted the professorship of the chair of Materia Medica in the University, then made vacant by the resignation of Prof. S. C. Griffiths. When Prof. Benjamin Rush died, 1813, Barton applied for the vacant chair, practice of physic, was appointed and then resigned the professorship of Materia Medica. This position in conjunction with that of Natural History and Botany he continued to hold during his life. In 1802, he became one of the vice-presidents of the American Philosophical Society. He began the "Medical and Physical Journal" of Philadelphia in 1803 and 1804, and also issued the "Elements of Botany." In 1807 he published "Eulogy on Dr. Priestly" and "Discourse of the Principal Desiderata of Natural History." In 1798 he issued a work entitled "Collections toward a Materia Medica of the United States" which he afterwards rewrote and enlarged in two volumes, the first appearing in 1801, the second in 1804, and in 1810 the entire work was revised in one volume. This was his most valuable contribution as we view the matter, and very rare at present.

Dr. Barton died of hereditary gout December 19, 1815. Three days before his death he wrote a paper on a new genus of plants that had been named in his honor.

Dr. Barton was an energetic worker, but a careless writer. He was an industrious student, but would not correct his manuscript, and thus his publications present literary faults that should not have occured with one possessed of the accomplishments and education of the author. This fact usually drew upon him some adverse criticisms upon the appearance of a work from his pen.

Dr. Barton was tall, well-formed and handsome. His disposition was irregular and his temperament often irritable and impatient. A pioneer in the field of American botanical remedies his name will be linked with the early history of many valuable drugs. Those who have his "Collections for a vegetable Materia Medica" possess a work that cannot often be replaced. In our research into the history of American medicinal plants it will be found that Prof. B. S. Barton is usually mentioned as one of the earliest authorities.

[†] Collections towards a Materia Medica of the United States, 1798, p. 31.

CERCIS.

RED-BUD.

Parts Used.—The bark of the Cercis canadensis, *Linnæus.*

Natural Order, Leguminosæ, Suborder Cæsalpinieæ, Tribe Bauhinieæ.

Common Names.—The tree is usually known as Red Bud, a name derived from the appearance in early spring of the numerous red flower buds on the naked branches.

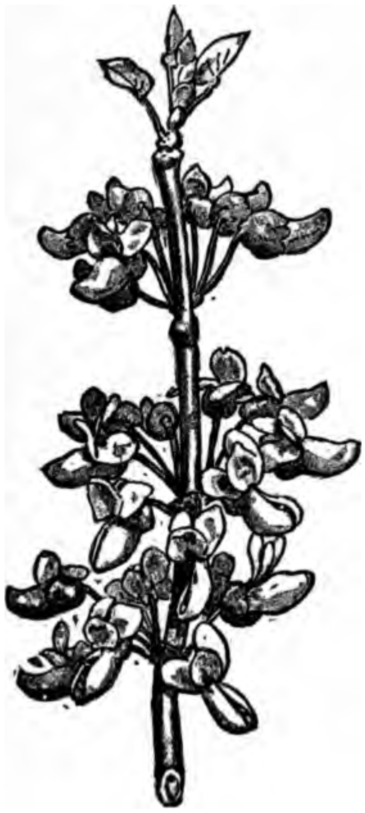

Fig. 150.
A flowering branch of Cercis canadensis.

There is another name given to it, Judas Tree, which is not so applicable. In the southern portion of Europe, the original species, Cercis Siliquastrum grows, and is also abundant in Palestine. By some means in old times it acquired the reputation of being the tree on which Judas hanged himself, and, hence, came to be known as Judas Tree.[*] It being natural that the newly discovered tree in this country should be designated by a similar common name as the European, it was called American Judas Tree and finally the adjective being dropped, simply Judas Tree. Without the above explanation the application of the name to an exclusively American tree would certainly seem strange.

Botanical Description.—Red-Bud tree is usually a small tree from twenty to thirty feet high, although frequently it attains a height of fifty feet and has a stem about a foot in diameter.

It is rare in Western New York, absent from New England, and occurs from Western Pennsylvania to Nebraska, south to the Gulf and southwest to Indian Territory and Texas. It reaches into greatest developement in Southern Arkansas and Eastern Texas.

The tree blossoms in the spring[†] before the leaves appear. The flowers are in axillary racemous clusters from the axes of the lower leaf scars of the last year's leaves. They are of a light red color and at the distance appearing like buds on the naked branches, have no doubt suggested the name Red-Bud tree.

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[*] It is needless to say that there is no authority for the statement that Judas hanged himself on the Cercis. The following trees have by different writers and tradition the same repute: The fig tree and popular tradition has it that never afterwards did the tree bear fruit; the aspen tree, and it is said that the leaves quiver and quake with their guilt to this day; the elder, which in Palestine is a good sized tree, and Maundevile states that there stood in the vicinity of Mount Sion, "The tree of Eldre, that Judas henge himself upon, for despeyr."

Of the Cercis, Gerarde (1597) says, "this is ye tree whereon Judas did hange himselfe, and not upon ye eldre, as it is said."

There is no Biblical data to support any of these traditions. St. Matthew simply states that Judas "went out and hanged himself."

[†] April at Cincinnati.

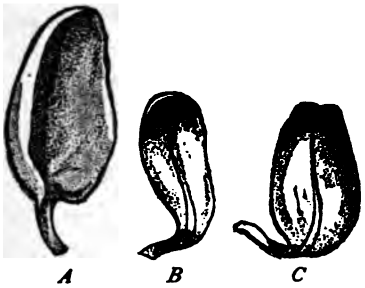

FIG. 151.
Petals of Cercis canadensis; *a*, keel petal; *b*, side petals; *c*, banner petal.

There are five to ten flowers in each cluster and these clusters are produced so thickly on the branches that the tree when in bloom is a mass of red and a conspicuous object even at a distance. The flowers have a pleasant, tart taste, and are said to have been used as pickles by the early French settlers.

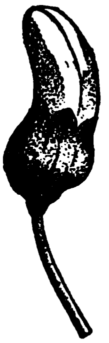

FIG. 152.
A flower bud of Cercis canadensis.

The inflorescence is racemous but the peduncle is so short that without close examination the flowers would be supposed to be in umbellate clusters. The pedicles are one-half an inch long, slender smooth, and of a deep red color, the same hue as the calyx. They are articulated at the base of the flowers, hence, the flowers that do not set fruit fall away leaving the pedicles.

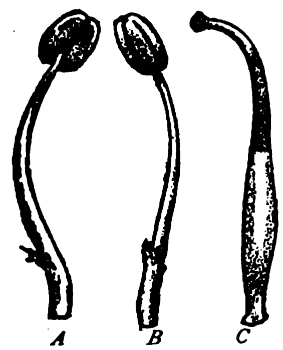

FIG. 153.
Cercis canadensis; *a*, outer view of stamen; *b*, inner view of stamen; *c*, pistil.

The calyx is cup-shaped, colored a deeper red than the petals, compressed laterally, gibbous beneath, and toothed with five small, blunt, subequal teeth. The five petals are imperfectly papilionaceous and are distinct and clawed. The two keel petals are the largest and enclose all others in the bud. They do not cohere together, but overlap and are curved, boat-shaped, enclosing the stamens and pistil. The two side petals and the banner petal are recurved, and subequal in size.[*]

The stamens are ten, distinct[†] and nearly equal the keel petals in which they are enclosed. The filaments are slender, incurved, and have a small bunch of hair near the base. The anthers in the bud are of a pink color; they are introse opening by longitudinal slits. The pollen is smooth, oval, and marked with a longitudinal groove. The pistil is slender, and about the length of the stamens.

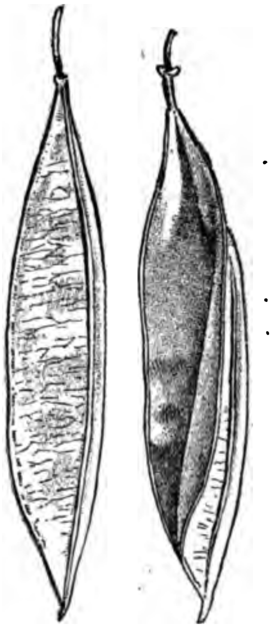

FIG. 154.
Fruit-pods of Cercis canadensis. Before and after dehiscing.

The fruit is a dry, flat, pod (legume,) about three inches long which hangs in clusters to the branches through the winter, and usually falls in the early

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[*] The flowers depart from the type of the usual papilionaceous flowers of the large Natural Order Leguminosæ. In a true papilionaceous corolla the banner is the largest petal and encloses the others in the bud, and the two keel petals are more or less cohering along the lower margin.

[†] In this again the plant departs from the usual Leguminous flowers, which generally have the filaments of nine of the stamens united.

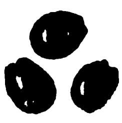

FIG. 155. Seed of Cercis canadensis.

spring. It is net-veined and has a narrow wing on the upper edge giving it the appearance of having a prominent vein along that side. It does not open while attached to the tree, but after falling, the sides separate along the lower edge, and, no doubt, the action of moisture is direct cause of the dehiscence. The seed are small, round, flattened, smooth, of a light brown color.

The leaves are orbicular cordate, four to six inches in diameter, entire, palmately seven-veined, abruptly acute at the apex, smooth, or somewhat pubescent beneath when young, dark green above, light colored beneath, and borne on leaf-stalks a couple of inches long, which at the junction with the blade are slightly enlarged and imperfectly articulated. This structure of the petiole shows that the leaf is not theoretically simple, but pinnate, consisting of a single leaflet.

BOTANICAL HISTORY.—There is another species, Cercis Siliquastrum, *Linn.*, very similar to our species, growing in Southern Europe, in Palestine and other portions of Eastern Asia, and in Japan. This tree was known to the earliest botanist and called Siliquastrum.[*]

Linnæus (1737)[†] changed the name to Cercis. Theophrastus mentioned under this name[‡] a tree of Greece, which was related to the poplars, but classed with Leguminous plants, and Linnæus deciding that it was the Judas Tree reapplied the name Cercis to this genus.

The American plant appears to have been first collected by Vernon and Krieg in 1663[§] and described by Ray.[‖]

It was cultivated in Europe as early as 1730, and is mentioned in all the Linnæan works.[¶]

Linnæus, 1753,[**] gave it the specific name, Cercis canadensis, under which name it has been described by most subsequent writers, and by all American authors.

The name Siliquastrum is retained for the genus by a few botanists, Adanson, (1763,) and Mœnch (1794,) who called the American plant Siliquastrum cordatum.[††]

DESCRIPTION OF THE DRUG.—The inner bark of the root is the most characteristic part. It has a reddish brown color when recent, assuming a brown color upon drying. It is intensely astringent, exceeding in this respect such well known bodies as the oak and hemlock. When chewed, it puckers the mucous membranes of the mouth almost as sensibly as the green fruit of the persimmon tree, or as the seed of the fruit of black haw (Viburnum prunfolium).

Cercis canadensis contains neither alkaloid, nor crystalline glucosid that we could discover and the only constituent of marked characteristic was the tannin that gave the astringency. This tannin was extracted by alcohol and water, and freely by glycerine. It precipitated ferric salts, blue if in dilute solution, and immediately threw all traces of gelatine from solutions containing that body. Owing to the small size of the tree, it is probable that the bark will never be of sufficient abundance to compete in the market with oak and hemlock as a tanning agent, but the richness of the tannin commends it to consideration. Should the bark of this tree come into use as a medicinal agent, it must necessarily be as a vegetable astringent. Owing to the abundance of other well known astringents, however, that may act more kindly, at least being well understood, it is improbable that Cercis will be used in medicine to any extent.

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[*] As early as 1585 by Durantes an Italian botanist, and the genus was established under this name by Tournefort, (Institutiones Rei Herbariæ, p. 646) in 1700. The name is from the Latin *Siliqua*, the pod of the pea, and the term is still used in botany applied to the fruit of Cruciferous plants.

[†] Genera Plantarum, 1737, p. 125

[‡] κερκις of the Greek.

Theophrastus was a Greek philosopher of Athens who lived in the fourth century before Christ. He wrote a large number of works on various subjects, one, a History of Plants, in nine volumes, being a very complete account of all that was known on the subject at that early day.

[§] See note [**], page 110.

[‖] Under the name "Ceratia agrestis virginiana, folio rotundo minori."

The genus Ceratia of old writers, now known as Ceratonia is a genus of Leguminous trees that includes the tree yielding the St. John's bread.

[¶] At first under the name "Cercis foliis cordatis pubescentibus," a misleading name, as the leaves are the contrary from being "most pubescent."

[**] Species Plantarum, 1st edition, 1753, vol. i., p. 374.

[††] Methodus Plantas, 1794, p. 54.

MEDICAL HISTORY AND PROPERTIES.—Cercis has never been used in medicine. The dispensatories do not honor it by a position, even Prof. King omitting it from the American Dispensatory. Neither Thomsonian nor Eclectic recognize it and Regular medicine bears no evidence of the existence of such a drug beyond a few brief notes, published by Dr. Wm. R. Smith, Sr.,* who states, " I have had over twenty years' experience in the use of Cercis canadensis, and can, with confidence, recommend it to the profession. In all cases were an astringent† is indicated it will give satisfaction, and it has the advantage over all other articles of that class, that it can be given when the stomach is irritable, without increasing the trouble, making it very valuable in the treatment of the diarrhœas peculiar to infancy. But it is in the treatment of chronic diarrhœa and dysentery that its curative action is most manifest. During the war I used it at the Post Hospital at Cairo, in the treatment of that scourge of the western army,—camp diarrhœa,—with extraordinary success." Dr. Smith mixed one fluid ounce of Cercis with three fluid ounces of aromatic syrup of rhubarb, and in chronic dysentery administered a teaspoonful every four hours. In chronic diarrhœa he administered the fluid extract of Cercis in teaspoonful doses after each discharge· He also employed Cercis in leucorrhœa and gleet.

Cercis is not employed in domestic medicine that we can establish and is not a drug of commerce.

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*New Preparations, Geo. S. Davis, Detroit. Mich., 1879, pp. 141, 251.

†We wrote our paper on the chemistry of the drug before consulting this paper of Dr. Smith.

ERECHTITES HIERACIFOLIA.

FIREWEED.

Parts Used.—The entire plant Erechtites hieracifolia, *Rafinesque*.

Natural Order Compositæ, Tribe Senecionideæ, Sub-tribe Eusenecioneæ.

Botanical Description.—Fireweed is a frequent annual weed growing in woodland pastures and waste places. It seems to require a loose soil and prefers light shade. A recent clearing, especially if it has been burned over, is a favorite habitat for the plant, hence, the name Fireweed. The plant is very brittle and easily broken, and probably on this account, it grows but rarely in fields that are grazed.

The usual height of the plant is two to three feet though in favorable rich locations it attains twice this size. The stem is strictly erect, and in the plants unbranched excepting the panicle above. It varies from the size of a lead pencil to an inch in diameter, and is round and striate. It has a large pith in the center and is easily crushed. The color is light green and the entire plant, stem, leaves and flowers have a remarkably uniform green color.

The leaves are two to four inches long, and about one-fourth as wide They are alternate, spreading, lanceolate-oblong, acute, light green both sides, veiny, sessile, smooth or slightly hairy. The margins are unequally cut-serrate, with sharp teeth formed by the projecting veins. The upper leaves are narrower, linear, auriclate or clasping at the base, and more laciniately cut.

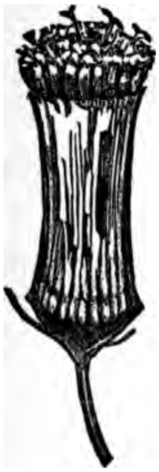


Fig. 156.
Section of a head of flowers of Erechtites hieracifolia.

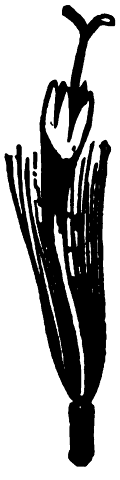
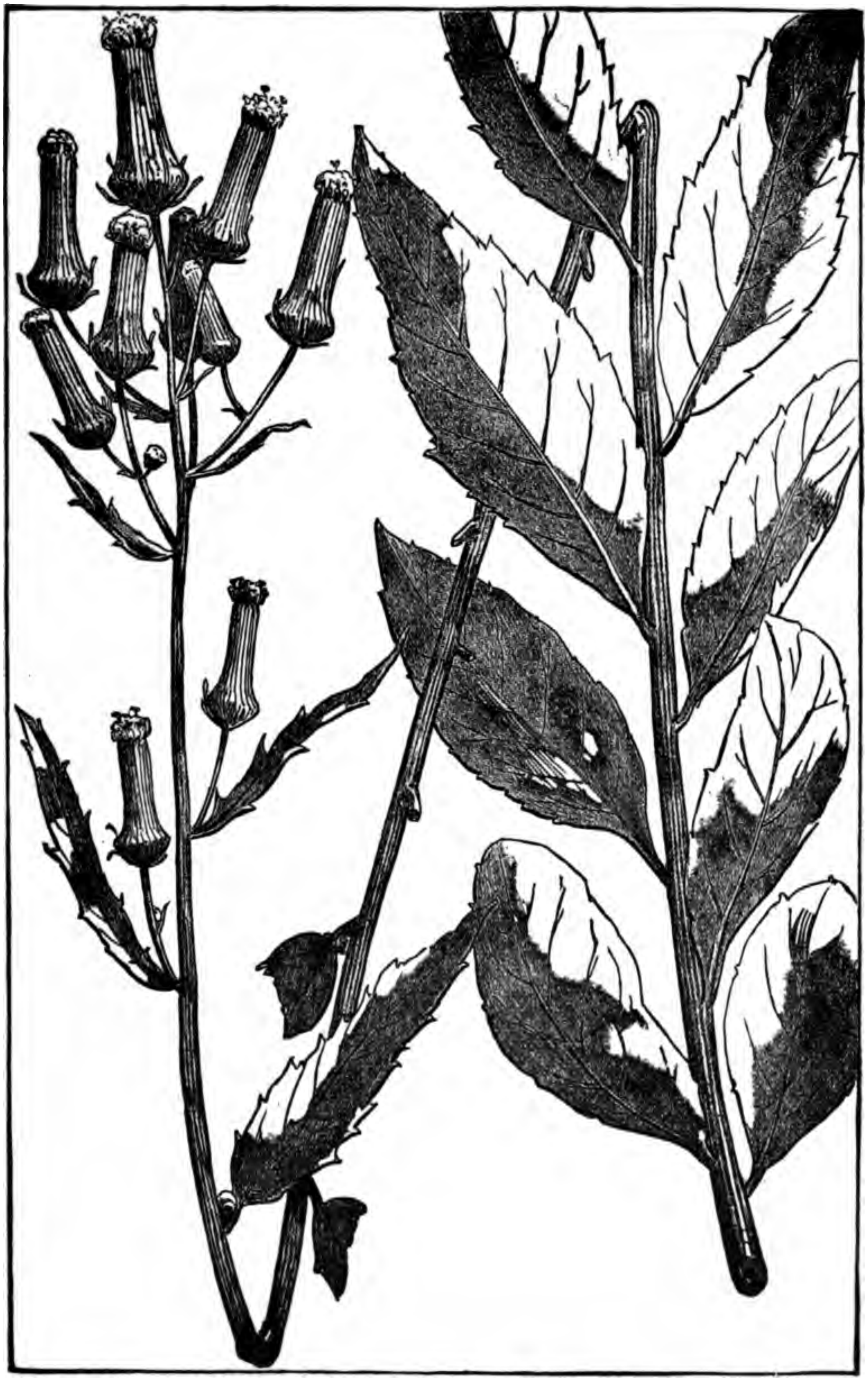


Fig. 157.
A single flower of Erechtites hieracifolia.

The flowers appear in the latter part of August and September and are borne in a terminal loose panicled corymb. They are not conspicuous, from the absence of color, being about the same green hue as the plant. They belong to the large family known as compound flowers, consisting of very numerous minute flowers collected together in a head and surrounded by leafy bracts called an involucre. Our illustration (fig. 156) represents one of these heads cut open showing its structure and our figure 157 a single flower enlarged. The flower heads, are about an inch long, always erect, on slender bracteate peduncles. The involucre is cylindrical and swollen at its base, consisting of a single row of equal lineal scales. Externally on the base of the involucre are a few (about a dozen) short bracteate scales.

The heads do not have the outside flowers linear as is the case with many compound flowers, but they are all tubular as fig. 157. There are, however, two kinds in about equal number. The outer are narrower, have only two or three teeth and have a pistil only, the centre flowers (such as we illustrate) have generally five teeth to the corolla, and both stamens and pistil. The two kinds

PLATE XXXVIII.



ERECTHITES HIERACIFOLIA.

(NATURAL SIZE.)

of flowers can be most readily distinguished by cutting open a head in the bud. According to our count there are from 150 to 200 flowers in each head. The fruit as in all Compositæ is a dry achenium. It is crowned by a very copious sessile pappus, by which it is readily dispersed by the wind.

BOTANICAL HISTORY.—Aiton states that this plant was introduced into Europe by Rev. John Banister,[*] in 1699, but it was evidently known before, as Hermann[†] mentioned it in 1689 as an exotic plant observed in the botanical garden at Leydon,[‡] and Plukenett,[§] in 1691, in his "Phytographia."

It was classed by the first writers[‖] with the genus Senecio,[¶] in which family it was allowed to remain by Linnæus, who christened it Senecio hieracifolius[**] in his species Plantarum (1753). As Senecio hieracifolius it is known in all the botanical works of Europe and this country, such as Linnæus, Pursh, Muhlenberg, Barton, and the entire series of Eaton's Manuals. Fortunately, the medical history has not been burdened with this synonym, having escaped very largely, because the plant was not much used in medicine until its present name had been firmly acquired.

In 1817, Rafinesque,[††] separated this plant from the genus Senecio under the name Erechtites[‡‡] hieracifolia, and it is one of the few, of the many changes in nomenclature made by this author, that have stood the test of time.

The genus differs from Senecio, chiefly in having two kinds of tubular florets, the outer, pistillate only; the central, perfect. In Senecio all the disk florets are perfect. In fruit, involucre and habit the plant is a true Senecio.

De Candolle, in 1833,[§§] adopted Rafinesque's change, shortly afterward Endlicher, then Torrey and Gray, then it was introduced into the new Manuals, first Woods, (1845), then Gray's, (1856), and the name Erechtites hieracifolia thus became the accepted name of the plant.

The genus, as now constituted, consists of this single species in North America, one in Asia, and about a dozen in Australia and New Zealand.

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[*] See page 26, note †.

[†] See page 9, note ‖.

[‡] Paradisi batavi prodromus, P. Hermann, Amsterdam, 1689, page 226.

[§] See vol. 1., page 247, note ‡. The "Phytographia" was the first work issued by Plukenett, and it consisted entirely of figures of new plants. The figure of Fireweed is figure 1, of plate 112.

[‖] Senecio americanus altissimus, blattariæ f. hieracii folio.—Hermann, (1689).

Senecio foliis lanceolatis amplexicaulibus lævibus acute sinuatis denticulatis, caule herbaceo.—Linnæus, (1737).

Senecio corollis nudis, foliis amplexicaulibus laceris, caule herbaceo erecto.—Linnæus, (1748).

[¶] The genus Senecio is a very large family, numbering about nine hundred species according to late authority. It is well represented in the United States, one species, Senecio aureus, being used quite largely by the Eclectics in medicine and will be considered in this work.

The genus is distinguished from most others of the great Order Compositæ by having an involucre of a single series of equal scales. The flowers are usually yellow, and in this country and Europe the plants are herbaceous. In New Zealand, Australia and tropical countries Senecios are often shrubs with thick evergreen leaves.

[**] The specific name *hieracifolia* refers to a resemblance of the leaves to those of the genus Hieracium. This is also a large family of the Compositæ, very numerously represented in Europe, where it takes the place of the genera Aster and Solidago in this country. The resemblance was noticed by the first to describe the plant, and was made one of the specific characters which Linnæus emphasized by making it the specific name for the plant. Darlington very truly says, "the specific name sonchifolius would have been more appropriate for the species, as its entire habits are more that of a Sonchus than a Hieracium."

[††] Florula Ludoviciana, 1817, p. 65.

[‡‡] The derivation of the name Erechtites is not certainly known. It is supposed that Rafinesque applied it to this plant, because it is thought that the plant known to the Ancients under this name was a species of Senecio. It was originally derived, no doubt, from Erechtites, one of the early kings of Attica, according to the legends. It is thought that the name is only one of the titles of Neptune. The name as originally spelled is Erechtites, but in a number of works, including Bentham and Hooker and Gray's Manual an extra *h* has been inserted, making it Erechthites. Gray corrects his spelling in his recent Synoptical Flora.

Wood states that the name is derived from the Greek, *ερεχθω*, *to trouble*, because the plant is a troublesome weed, but this derivation is no doubt incorrect.

[§§] It is evident that De Candolle was urged by letter from Rafinesque to adopt this change in the Prodromus and thus give more prominence to the view than the publication of the name in Rafinesque's works would have done.

De Candolle as authority for the name cites "Rafinesque in literis," and states in a post note that "Rafinesque in a letter, 1832, perhaps not undeservedly distinguishes three species of Erechtites, but does not send the descriptions."

The following unimportant synonyms are mentioned, merely for completeness: Erechtites prælta and Erechtites elongata, supposed by Rafinesque to be distinct species, but thought now not to be even distinct forms; Neoceis hieracifolia, a name given by Cassini, a French botanist, who established a genus for the plant independent, but subsequent to Rafinesque; and Cineraria canadensis, a name under which the plant is described in Walter's old work.

COMMERCIAL HISTORY:—There is a small demand for the crude drug for making fomentations and pharmaceutical preparations. The dried leaves are the part used. They can be easily recognized by comparison with our illustration, but often those that are collected are from the lower part of the plant and are more obtuse than we have figured them, and being generally collected from larger plants, they are also of larger size, some of them being six inches long. In drying they assume a very dark or even black color. As will be explained further on, through a confusion of common names the Erigeron has been confounded with this plant and we find that much of the drug sold as Fireweed leaves is in reality the leaves of the Erigeron canadense and Erigeron annum. They can be readily recognized by their lighter color in drying, and also by their different shape.

There is considerable demand for the Oil of Fireweed,* and in investigating the subject we were considerably surprised to find that in reality the oil now sold on the general American drug market is not Oil of True Fireweed, but the Oil of Erigeron canadense, an entirely different plant.†

We obtained samples from a number of sources and did not obtain a single specimen of the true oil. It was shown conclusively that dealers in essential oils supplied as a rule Oil of Erigeron under the label Oil of Fireweed. One party seemed to be aware of that fact, for he extended the information that the substance labeled "Oil of Fireweed" was Oil of Erigeron, and that there was no true Oil of Fireweed in commerce. This view was conclusively corroborated by our investigation with others.

In one instance, we were informed that "We presume you mean Erigeron canadensis, as Fireweed is one of the numerous names of the oil." We were also informed that "The oil is received by us as Erigeron, and we sort it out by such tests as we know, selling as Erigeron that which we think is Erigeron, as Fireweed what we think is fireweed."‡ Thus it is shown in this instance, that a firm we consider among the most reliable handlers of essential oils, determined the matter by *selection*, and judging by the specimens supplied us, they obtained *only* Oil of Erigeron to select from. These statements together with the fact that in the general drug market of America we were not so fortunate as to obtain a single specimen of Oil of Fireweed, convinces us that the commercial history of this oil is remarkable, inasmuch as it has no commercial history. It seems also that this fact is known to some dealers, who have come to consider the term Oil of Fireweed a synonym for Oil of Erigeron. This view is somewhat justified by the fact that the name "Fireweed" is applied in published lists to a number of plants and among others to Erigeron canadensis, as was cited to us by a leading oil house as an authority for labeling the oil "Fireweed." The demand is altogether for Oil of Fireweed and not for Oil of Erechtites hieracifolia. The labels of dealers are invariably "Oil of Fireweed" and the proper name of the drug is not used either by dealer or consumer.[*]

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*This is especially the case with Eclectic physicians who perhaps are the only consumers of the drug.

†We refer to houses that make a specialty of dealing in essential oils. We obtained a strictly pure oil from Mr. Albert M. Todd, a distiller of essential oils at Nottawa, Michigan. We were surprised at the fact that the oil *our house* had handled for years, was not Oil of Fireweed, but Oil of Erigeron.

‡The Oil labeled Oil of Fireweed, obtained from this party was good Oil of Erigeron.

It is impossible to determine the amount of oil sold under the name Oil of Fireweed, but, Mr. Todd writes us, that in his opinion less than two hundred pounds per year of true Oil of Erechtites hieracifolia is produced. In our opinion but a trifling amount has heretofore been true to label.

DESCRIPTION.[†]—Natural Oil of Fireweed[‡] is neutral, transparent and colorless when freshly made from green plants by quick distillation with steam, if condensed in a clean tin worm and the process is not carried too far. If the vapor is condensed in rusty iron, or in copper pipes, the oil is reddish or brown. If the distillation is slow, even if the pipes are bright tin, the product is colored and resinous, especially if the distillation is carried until the oil ceases to pass, and, to avoid this feature, is at the expense of part of the possible yield. The last portions of the charge are always colored, and owing to the fact that makers do not separate the first from the last runnings, we find even fresh Oil of Fireweed, free from metal, to be colored.[§] The first part of the oil obtained is of less specific gravity than the latter portion.

Upon keeping colorless Oil of Fireweed in loosely corked vials, it becomes resinous and yellow; a few drops, exposed to the air from a leaking cork concretes and becomes solid. The cork stopper becomes hard and covered with resin. If the bottles be hermetically sealed the oil remains for a long time clear and colorless.

Oil of Fireweed has a peculiar odor that we can only describe by comparing it with Oil of Erigeron; they resemble each other. However, Oil of Erigeron possesses a slight fragrance that is distinctive, and, although both these oils have a peculiar harshness, neither is unpleasant to us.[||]

Specific Gravity.—The specific gravity of natural Oil of Fireweed (the entire distillate) ranges from 0.847 to 0.907 (Todd). If the natural oil be re-distilled in a current of steam, it begins to pass over with a gravity of 0.825, increasing to 0.919 (Todd).[¶] Finally, a yellow resin remains in the still. The recovered oil has a specific gravity of 0.859, at 15.5° C., (Todd).[*] This method of procedure (steam) does not, in our opinion, give the true gravity of the characteristic part of the oil, and in order to attain this object Prof. Power conducted a fractional distillation, separating the product into portions corresponding with the changes of boiling point, the result in his own words being as follows:

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[*] Doubtless if dealers had applied to any of the responsible makers of American essential oils, they would have met the courteous attention Mr. Todd extended us. These gentlemen have no reason to substitute and possibly accept that Oil of Fireweed was another name for Oil of Erigeron.

[†] The oils examined in this series were made expressly for our purpose by Mr. Albert M. Todd, of Nottawa, Michigan, from plants botanically true and identified by us. The information extended by Mr. Todd is particularly valuable, as he is an extensive maker and dealer in essential oils, and has exceptional facilities for manufacturing. The practical notes on distillation were kindly given by him and we hereby extend our thanks.

The investigations of all who united with us were made with the same oils and in a general way we hereby extend Mr. Todd the thanks of the several gentlemen. Mr. Todd also entered zealously into the subject, and his paper in the American Journal of Pharmacy, June, 1887, p. 302, may be considered an independent part of the study.

[‡] The term "natural" we use to distinguish the product of the distillation of the herb from the re-distilled oil.

[§] The distillation should not be carried too far.

[||] We have seen commercial "Oil of Neroli" that seemed to be contaminated with either Erigeron or Fireweed, but, we have not made a study of Neroli.

[¶] The distillation should not be carried too far. This result is remarkable for the difference in product.

"When subjected to distillation it began to boil at about 180° C., and the chief portion passed over between 180–200° C. Smaller fractions above this point were collected, but that distilling above 300° C., was very viscid, so that it did not flow readily from the flask, and was also dark in color. By fractional distillation the principal portion of the oil distilled between 185–190° C., (the mercury of the thermometer being entirely in the vapor). A very small and insignificant fraction was obtained below 185° C., and no fraction of constant boiling point above 190° C. The small fractions that distil above the latter temperature were evidently simple polymeric products, and were constantly formed with each successive distillation.

The fraction distilling between 180–190° C. is a bright, perfectly odorless, and very highly refractive liquid. The specific gravity at 15° C. is 0.8304."

This may be accepted as the gravity of the true oil, and it may be seen therefore that natural Oil of Fireweed is either contaminated with heavy resinous products, metals, or water from the steam. It may be safely said that the gravity of re-distilled Oil of Fireweed should neither exceed 0.850, nor fall below 0.825.

Boiling Point.—Oil of Fireweed begins to escape with steam at a temperature of 166° C., which quickly increases to 182° C. when the ebullition is brisk; increase of steam is followed by increase of temperature to about 188° C., when it remains constant for some time (Todd). This, in our opinion, is not expressive of the true boiling point of the oil, which must be determined alone and not in a current of steam. Prof. Power has determined (see preceeding) that re-distilled, dehydrated Oil of Fireweed begins to boil at 180° C.; but that only a small amount was obtained below 185° C.; the bulk distilling between 185° and 190° C.; that which passed afterward being small in amount, thick, colored polymers, of irregular and rising temperatures.

The boiling point of freshly distilled Oil of Fireweed should not be less than 180° C., nor greater than 190.[†]

CHEMISTRY OF OIL OF FIREWEED ($C_{15}H_{24}$).—The chemical examination was undertaken by Prof. Power, who considers the subject as follows:[‡]

"The first actual analysis of the oil of Erechtites which I can find recorded is that of Beilstein and Wiegand, and of quite recent date. These chemists found the oil to consist almost entirely of terpenes ($C_{10}H_{16}$). One of the terpenes, after treatment with sodium, they found to boil at 175° C., and to have the specific gravity 0.838 at 18.5° C. The higher boiling portion of the oil (240–410° C.), after treatment with sodium, also corresponded to the formula $C_{10}H_{16}$. No crystallizable compound with hydrochloric acid was obtained.[§]

In my hands, the composition of the pure oil was found to be as follows: 0.2555 gram of substance gave 0.8210 gram CO_2 and 0.2745 gram H_2O corresponding to 0.2239 gram C. and 0.0305 gram H. or 87.63 per cent. C. and 11.54 per cent. H.

CALCULATED FOR $C_{10}H_{16}$.	FOUND.
C_{10} = 88.24 per cent.	87.63 per cent.
H_{16} = 11.76 per cent.	11.54 per cent.
100.	99.17

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[*] This was the product of twenty pounds of natural Oil of Fireweed, eighteen pounds being recovered.

[†] If any considerable amount distils at less than 180° C. it is not Oil of Fireweed. If it distils above that it may be resinified.

[‡] The oil examined was that purified by Prof. Power, having a boiling point between 185° and 190° C., and a specific gravity of 0.8304.—*L.*

[§] Berichte der Deutsch. Chem. Ges., 1882, p. 2854, also Am. Journ. Phar., 1883, p. 372, and Proc. Am. Pharm. Assoc., 1883, p. 220.

This body is thus seen to consist of a terpene, and, with consideration of its boiling point, probably has the molecular formula $C_{15} H_{24}$, rather than $C_{10} H_{16}$, or in other words, to belong to the group of so-called sesqui-terpenes. This view may also, perhaps, be to some extent supported by the fact that, as Beilstein had found, it affords no crystallizable compound with hydrochloric acid, but absorbs one molecule of the latter.

Polarization.—The rotary power of natural Oil of Fireweed, according to Mr. Todd, varies from — 3.5 to + 4.4. This deviation of successive fractions by re-distillation is irregular as shown by Mr. Todd's investigation with eighteen fractions, and we fail to formulate a connection between specific gravity and polarization, although it will be noticed that the eighth fraction decreases in specific gravity from 0.8275 to 0.8255, and that the angle of polarization changes also at this point from + 4 to — 2 as shown by the following table:[*]

RE-DISTILLED OIL OF FIREWEED.

No. of fraction.	Sp. Gr. at 15° C.	Polarization.	No. of fraction.	Sp. Gr. at 15°. C.	Polarization.
1	0.825	—4	10	0.8269	+1
2	0.82575	—4	11	0.8277	+1
3	0.8263	—4	12	0.8282	+1
4	0.8268	+1	13	0.8292	+4
5	0.827	+5	14	0.831	+5
6	0.8273	+4	15	0.840	+2
7	0.8275	+4	16	0.8568	—9
8	0.8555	—2	17	0.888	—5.3
9	0.8267	0	18	0.919	—8.5

In this connection we requested Prof. Henry Trimble to consider the subject with a request to compare readings of one specimen of oil at different intervals to ascertain if there was a variation by time.[†] In reporting the result we use his words, as follows:

"The rotatory power was determined by a Wild polaristrobometer, or shadow polarimeter, which proved to be a very satisfactory instrument. Both the 100 and the 200 millimeter tubes were used at first, but as the former only serves to determine whether the substance is dextrogyre or lævogyre, and most instruments are constructed for a 200 M. M. tube, I will only give the figures obtained with the latter.

March	29th,	1887.	Average	of	6	readings,	+ 4.58°
April	25th,	"	"	of	5	"	+ 4.42°
May	6th,	"	"	of	5	"	+ 4.61°
June	8th,	"	"	of	5	"	+ 4.88°

The reading of April 25th were made with a Laurent polarimeter, and proved that the Wild instrument used is practically correct.

The 100 M. M. tube, when used, gave figures which averaged half of those given, thus proving the dextrogyre properties of the sample."

It will be seen that as yet age seems not to affect it." Prof. Trimble continues his work, and, when we come to consider Oil of Erigeron, will report regarding both oils.

Adulteration and Sophistication.—Since dealers admit that at present Oil of Fireweed is in reality Oil of Erigeron, we do not consider this substitution as at present on the market in the light of an adulteration. Attention, however, being now called to the fact that Fireweed and Erigeron are different, each will probably assume its legitimate sphere, and we shall endeavor to give methods to distinguish them, but we do not under-rate the extreme difficulty of identifying terpenes in mixture, even where the similarity in properties is not as great as it is with these two oils. The real adulterants would probably be Oil of Turpentine, Oil of Camphor, Oil of Hemlock, or Alcohol.

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[*] We again state that in our opinion the distillation by a current of steam is unreliable as a method of fractional separation. Although the bulk of the oil will distil at a mean temperature, the dividing of the distillate into even fractions is irrational. It would have been better to have obtained a less number of fractions and separated the portions into natural divisions as shown by a marked change in gravity or boiling point. This method of Mr. Todd is that employed in rectification of the oil on a manufacturing scale, and serves to eliminate the grosser impurities. The extremes as shown by the polarization are remarkable.

[†] This specimen of oil was kindly furnished Prof. Trimble by Mr. Todd, and was of the re-distilled mixed fractions, made for our purpose, and was the same as that employed elsewhere.

Oil of Erigeron.—Has usually a darker color, seldom being colorless at present. Its odor is so nearly like Fireweed as to render it impossible to describe their distinction. To determine whether it is Fireweed or Erigeron (adulterations being absent) proceed as follows:

If the oil is colored, distil a portion of it, taking all that passes over below 190° C. This will probably be colorless, but, should the distillate appear colored before it ceases to distil at 190° C. suspend the operation and mix the product.

Place a drop of the distillate on a porcelain slab, and then place in its center one drop of concentrated sulphuric acid. If it be Oil of Fireweed an immediate dark red color is produced, partly carbonaceous, brown and tar-like. If it is Oil of Erigeron, the darkest part of the color will be cherry red, but the major part of the color will be lemon yellow.

To a drop of the distillate on a porcelain slab, add a drop of concentrated nitric acid · if it be Oil of Fireweed an *immediate* deep brown color results; in some portions where but a small portion of acid is present, assuming a greenish hue; where an excess of acid is present a reddish brown color results. If it is Oil of Erigeron scarcely any change occurs at first, then a yellow, changing to a faint green. This test is characteristic and distinctive.

To a drop of the oil on a porcelain slab add one drop of concentrated hydrochloric acid. If it be Oil of Fireweed, a light greenish brown color is produced; if it be Oil of Erigeron only a faint greenish tinge results. Sprinkle into this acid a small portion of powdered bichromate of potassium; Oil of Fireweed gives a brown color, which changes to a beautiful emerald green, while Oil of Erigeron gives an orange color where the salt is dissolving, which gradually fades away, assuming a slight dirty green color as it disappears. In a short time all color has passed away with the Erigeron, while the Fireweed remains deep green. If a drop of concentrated hydrochloric acid on a porcelain slab be colored yellow by dissolving in it a little bichromate of potassium, a drop of Oil of Fireweed will produce an immediate green, while a drop of Oil of Erigeron slowly changes to greenish and fades away, the Fireweed remaining longer.

Place 30 C. C. of the distillate in a retort and gradually raise the temperature to 170° C. if it begins to distil, and mostly comes over when the temperature reaches 175° C. it is Oil of Fireweed; if the temperature reaches 185 before it distils freely, and then most of the oil distils on the temperature reaching 190° C. it is Oil of Erigeron.*

In this connection we present the following from Prof. F. B. Power prepared for this publication:

"In a paper entitled: "*Zur Kenntniss der Terpene und ætherischen Oele,*" Wallach† has quite recently directed attention to some color reactions which he considers peculiar to the terpenes of the molecular formula, $C_{15} H_{24}$, and which consist in dissolving the terpene in an excess of chloroform, adding a few drops of concentrated sulphuric acid, and shaking. The chloroform is stated to become at first intensely green, then blue, and, upon warming, red. The beautiful indigo-blue color is best obtained when the terpene is dissolved in glacial acetic acid, and a little concentrated sulphuric acid gradually added. It was furthermore observed that the freshly distilled terpene does not give the reaction as well as the resinified.

The reaction described by Wallach is also afforded by the oils under notice, although the conditions under which the reaction takes place appears to be subject to some variations, even in specimens of perfectly pure oils. The test is best performed by dissolving one drop of the rectified Oil of Erigeron or Fireweed in about fifty (50) minims of *absolute* glacial acetic acid,‡ subsequently adding one drop of concentrated sulphuric acid, and shaking the mixture. A green color is first produced, which soon becomes lighter, and in a short time changes to a beautiful purplish-blue, violet or lavender tint. The oils with which my experiments were made showed this reaction most quickly and handsomely in the Erigeron Oil, and the test seemed to be more characteristic of the latter than of the Oil of Fireweed. Upon communicating my observations to Professor Lloyd, who had kindly furnished me with the oils, the latter gentleman repeated the test, but found the conditions the reverse of those above noted,—namely, that the blue color was produced more quickly in the Oil of Fireweed than in the Oil of Erigeron. In order to be assured that neither of as had erred in regard to these observations, I was again kindly favored by Professor Lloyd with specimens of the pure rectified oils, obtained from the same original source as those previously examined, and the tests were carefully repeated. Although both specimens of the same oil agreed in their general characters, such as odor, etc., and the correctness of my observations with the first specimens was confirmed, I found that with the second specimens of oil the reaction was indeed, afforded more quickly by the Oil of Fireweed than by the Oil of Erigeron, and that both oils produced the same handsome blue or purplish tint, which showed no marked distinction. To what cause this variation of the oils in question under this test may be attributed, I am unable to say, since I believe both specimens to have been distilled from the respective plants at the same time, although one specimen may possibly in the meantime have been more exposed to the action of the air than the other. A specimen of old, and quite dark-colored Oil of Erigeron, when tested in the above-described manner, afforded simply a dirty-brown color, so that the colorless, recently rectified oil appears best adapted for the test. The handsome color is not produced nearly so well in chloroformic solution, nor when any other solvent than glacial acetic acid is used. This statement applies at least, besides chloroform, to alcohol, ether, petroleum ether, and benzol, which were tried without success. Oil of Turpentine affords no immediate coloration when tested in the same manner as the Oils of Erigeron and Fireweed, and upon standing develops simply a yellowish color. When, with the two latter oils, a drop of nitric acid is used in the test, instead of sulphuric acid, a blue color is also produced, but which is quite distinct from that produced by the latter acid.

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*Admit that each distillation will produce some polymers of higher boiling points.

†Liebig's Annalen der Chemie. Bd 238, (1886) p. 87.

‡It is quite important that an absolute acetic acid should be used in this test, as the presence of small amounts of water will render the solution of the oil imperfect or milky.

It would not seem probable that the above described reaction is limited to the terpenes of the molecular formula $C_{15} H_{24}$, as Wallach has presumed, for the boiling point of the Erigeron Oil would certainly indicate that its molecular formula is $C_{10} H_{16}$, and that it does not belong to the class of so-called *sesqui terpenes*, although I have not yet been able to establish the supposition experimentally by a determination of its vapor density."

Mixtures of Erigeron and Fireweed—[*]When mixtures are made, color test is unreliable.[†] It is true that as the proportion of Oil of Fireweed increases the characters shown by the preceeding tests are intensified, but there is no color method of determining the amount of each. The difference in boiling point is the more conclusive method suggested to us and mixtures in varying proportions were closely indentified by Mr. Weld, the following rule being evolved.

Introduce 30 C. C. of the suspected oil into a retort and gradually raise the temperature to 175° C., the proportion obtained is the of Oil of Fireweed proportion, very little Erigeron passing. If the remainder is Oil of Erigeron, the temperature rises quickly from 175° C. to 185° C., then between that and 190° C. about two-thirds the remainder will distil. At this point the distillation slackens and the temperature rises to 230° C., a darker liquid distilling, equalling in bulk about one-fifth the liquid that remained in the retort after the Fireweed Oil had been recovered. The latter liquid consists of polymers and is produced from recently distilled oils as well as from old ones. In case the oils are old and resinous, the amount of distillate below 175° C. (Oil of Fireweed) and 190° C. (Oil of Erigeron) will be less in amount than if fresh, but the fractions obtained between the temperatures named represent about the proportion in which the oils were mixed.

Oil of Turpentine—Is the usual adulterant of essential oils that will disguise its sensible characters, and, as is well known, many essential oils will completely cover its odor and flavor. Comparisons of mixtures of pure Oil of Fireweed and Turpentine, in varying proportions, show us that its presence is easily detected by the sense of smell and taste. Oil of Fireweed, fresh or old, has no resemblance to Oil of Turpentine, and the contamination of that substance is evident if the foreign odor of Turpentine is present. However, while the presence of this impurity is easily demonstrated, the amount of contamination is not shown, for mixtures in various amounts, ranging from one part of Turpentine to three of Oil of Fireweed, and equal amounts of each were not to be distinguished.

Oil of Turpentine boils at a temperature of from 150 to 160° C, and thus, by fractional distillation, will mostly vaporize before the temperature reaches 170°, at which point the Oil of Fireweed begins to appear. The proportion of the distillate (Turpentine) between 150 and 160° C, compared with the undistilled portion, will fairly identify the proportion of the adulteration, if Turpentine only is the foreign body.[*]

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[*] Prof. Virgil Coblentz made for us a line of determinations of color tests of commercial Oils of Fireweed. He found that all specimens were Oil of Erigeron.

[†] Mr. H. W. Weld conducted the detail work of distillation in the McMicken University laboratory, Cincinnati. It is needless for us to say that the result is accurate.

Oil of Camphor.—Recent years have noted the importation into America of large amounts of Camphor Oil and the known consumption is small. In view of the general opinion that it finds its way into essential oils, we examined the possibility of its being used to adulterate Oil of Fireweed. We doubt if it is practicable, for even a small amount of Oil of Camphor imparts a strong odor and taste of Camphor. Especially is the odor prominent if the mixed oil is rubbed between the fingers; then the Fireweed evaporates, leaving the Camphor.

Oil of Spruce[†]—Like Oil of Camphor, imparts a peculiar odor that is easily distinguished. We found that even in small proportion it was plainly perceptible, and we have no reason to believe it a feasible adulterant. There is no chemical method known to us for distinguishing the presence of either of these Oils (Turpentine, Camphor or Spruce) or their proportion.[‡]

Alcohol, Ether, Chloroform.—Ether is shown by its odor, and Chloroform by its odor and gravity. Either of them is separated by raising the mixture to its boiling point, when the adulterant will escape before the temperature reaches the boiling point of the oil. If a mixture of Alcohol and Oil of Fireweed be agitated with its bulk of water, and permitted to stand until a clear line of demarcation forms, the oily layer will have decreased in proportion to the Alcohol present in the original oil. As Alcohol is, in our opinion, (aside from Oil of Erigeron) the most likely substance to be employed as an adulterant, it should be considered first.

Finally, we will add that purchasers who really desire the true oil, and purchase from responsible dealers in essential oils, can, without doubt, hereafter obtain true Oil of Fireweed, providing a fair price is allowed. Use the name, Erechtites hieracifolia, and not Oil of Fireweed.[§]

MEDICAL HISTORY AND PROPERTY.—Rafinesque (1830)[||] briefly states that the plant is "vulnerary, acrid tonic, astringent, useful in hemorrhage, wounds, headache, inflammation, salt rheum, herpes, diseases of skin, etc." It is evident that he knew but little, if anything, personally of its uses, and he neglects to give his authority.

Lee (1848)[¶] curtails Rafinesque's contribution, and adds that the essential oil is used for piles. That it had then some reputation is evidenced from the fact that Augustine Duhamel (1844)[**] read a paper before the Philadelphia College of Pharmacy, "on Oil of Fireweed,[††] distilled in one of the Western States, from the common Fireweed plant, where it is much used." Subsequently, Bigelow[‡‡] and Williams[§§] corroborate this statement by giving the plant slight attention. However, it passed from view many years ago, and to writers of the Regular School of Medicine, the plant and oil are comparatively unknown.

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[*] We call attention to the fact that in these fractional distillations, the process must be conducted slowly.

[†] Oil of Spruce, Hemlock and Cedar, we now view as various names applied to one substance.

[‡] It would seem that dry hydrochloric acid gas would form turpentine camphor in the presence of Oil of Turpentine and thus identify itself. Our experience, corroborated by that of Mr. Weld, is to the effect that associated products from Oil of Fireweed, by action of HCl, obscure the reaction.

[§] We are not believers in the utter depravity of the Jobbing Druggist. Upon the contrary, we venture to assert that they are, as a class, willing to supply the demand, If pure oils are *desired*, they can be obtained. In this connection, we doubt not, that dealers in essential oils will, to a man, be interested in these papers, and perhaps feel under obligations to us for the information derived by this rather perplexing series of investigations.

[||] Medical Flora of the United States, Vol. II., p. 262.

[¶] Medicinal Plants of New York, p. 33.

[**] American Journal of Pharmacy (1844), p. 8.

[††] Mr. Duhamel states that the oil was distilled from Erechtites.

[‡‡] List of Medical Plants of Ohio, p. 20.

[§§] Transactions American Medical Association, Vol. II., p. 896.

The United States Dispensatory has never recognized either the drug or its products, which strikes us as a peculiar oversight. Prof. Maisch, one of the most painstaking searchers into substances pertaining to the Materia Medica of America, in the National Dispensatory, gives the name "Fireweed" as a synonym for Erigeron, only, neglecting the plant, Erechtites. Neither Cutler, Schoepf, nor Barton, mention it. Hence, the following contribution from Prof. Bartholow will prove of more than ordinary value.*

A Practical Note on the Actions and Uses of the Oil of Erechtites.—(Written for this publication by Roberts Bartholow, M. D., L. L. D., Professor of Materia Medica, General Therapeutics and Hygiene, in the Jefferson Medical College of Philadelphia).

A preliminary physiological investigation demonstrated that the Oil of Erechtites possesses the general properties of the oils composing the antiseptic group.

It is not irritant to the stomach, and it rather improves than lessens the appetite and digestion. The glands of the stomach, and of the intestines, and, probably, of the pancreas, are stimulated by it, pouring out an abundant secretion. The result is that the evacuations are easy, more copious, and rather more frequent. In some cases of habitual constipation, it proved quite effective. In such cases, accompanied by flatulence and acid fermentation, it is often of signal service. In membranous enteritis, an affection difficult to to cure, it has seemed to be, in a high degree, useful.

On the organs of circulation the Oil of Erechtites has effects corresponding to those of the same group. It first stimulates the heart, the arterioles dilate, and a general subjective sensation of warmth is felt throughout the body. Then the skin becomes perspiring, and the sensation of warmth is succeeded by a fall of temperature, by a slower pulse, and by contraction, instead of dilatation, of the arterioles. A rise in the vascular tension subsequently takes place.

The Oil of Erechtites is rapidly diffusive, quickly absorbed, and quickly excreted. It is eliminated largely by the lungs; also, by the kidneys and the skin. The most important of its therapeutical properties, are those due to the local action in the process of elimination. In chronic bronchitis, and pulmonary affections, accompanied by catarrh of the air-tubes, in the neuroses of the chest, and in coughs of local origin, it exerts a therapeutical power, not unlike, and probably nearly, if not quite, equal to that of terebene. As the oil is volatilizable, it can also be given effectively by inhalation, alone or in combination with other volatile or gaseous substances.

It has acted in a very beneficial manner in cases of catarrh of the genito-urinary tract—in pyelitis, cystitis, gleet, etc. Acting topically, no doubt, as it passes with the urine, it appears to have a systemic action on the nervous apparatus, and allays irritability.

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*Prof. Bartholow employed true Oil of Erechtites, furnished by us, and of the quality employed in our chemical investigations.

I should not, also, fail to mention that this remedy has seemed to me to be very useful in Sciatica, in muscular rheumatism and cognate affections. A larger experience is needed in respect to its power in these troubles.

The oil is not disagreeable to most persons, and is usually taken without objection. It may be dropped on a lump of sugar; it may be made into an emulsion, or taken in gelatine capsules.

HISTORY OF OIL OF FIREWEED IN THE ECLECTIC SCHOOL OF MEDICINE.—In Eclectic Medicine, Oil of Fireweed has been of some importance, and the plant has been used more or less for a number of years. As early as 1852.[*] Prof. King referred to the fact that Dr. A. R. Wyeth, of Pennsylvania, used a tincture of Senecio hieracifolius[†] in the treatment of dysentery, "promptly arresting the muco-sanguineous discharges, relieving pain, and effecting a speedy cure. In the summer complaint of children, he has found it to prove almost invariably successful, even in cases where other means failed."

Prof Scudder[‡] considers it worthy of investigation, saying: "We have here another remedy that requires study. It influences mucous tissue, especially of the bowels and lungs."[§] This embraces the literature on the medicinal record of the plant, outside of Homœopathy, which section is considered by Prof. E. M. Hale in a special contribution.

The Oil.—That Erechtites hieracifolia was an oil-producing plant was known at an early day to American botanics, and Prof. King recognized Oil of Fireweed in the first edition of his dispensatory (1852).[||] He states that the plant appears to depend for its properties "upon a volatile oil, which may be obtained from the plant by distillation with water, and which possesses in an eminent degree the taste and odor of the plant."[¶] Prof. King writes as follows of the oil:[**]

"It seems to resemble the Oil of Fleabane in its influence upon various hemorrhages, and for which agent it is frequently substituted, and is considered by many to be the most efficacious in such cases, of the two oils. It also exerts a beneficial effect on mucous surfaces, and has been successfully used in diarrhœa, dysentery, hemorrhoids, etc. As an antispasmodic, it has been found of value in spasms of the stomach and bowels, colic, hiccough, hysteria, and pertussis, though it is apt to disagree with the stomach, causing nausea, etc. It is chiefly employed for the same purposes as the Oil of Fleabane.

The dose is from five to twenty drops on sugar, or in emulsion. When triturated with the extract of stramonium, Oil of Fireweed is said to form a valuable preparation for piles." This completes the record in Eclectic Medicine, recent authors having added little, if anything.[*]

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[*] Eclectic Dispensatory, King and Newton, p. 375.

[†] A synoym for this plant. (See our Botanical History, p 129.)

[‡] Specific Medication and Specific Medicines, Scudder, p. 128, tenth edition.

[§] In the light of Prof. Bartholow's recent work with true Oil of Fireweed, we feel that a tincture of the *fresh* matured plant promises to prove a valuable addition to our Materia Medica. (See Prof. Hale's paper on its uses in Homœopathy).

[||] This was distinguished from Oil of Erigeron or *fleabane*.

[¶] The first edition under the name, Eclectic Dispensatory of North America, by King and Newton, appeared in 1852; the second under the name, American Eclectic Dispensatory, by John King, appeared in 1854. In the second edition the oil was recognized among the volatile oils, and the plant was called Erechtites, instead of Senecio.

[**] Eclectic Dispensatory, (1854,) p. 1154.

In Homœopathy, Prof. E. M. Hale has for some years considered Erechtites of value, and we are pleased to offer his views of the subject, as follows:

HOMŒOPATHIC HISTORY AND USES OF ERECHTITES.—(Written for this publication by Edwin M. Hale, M. D., Emeritus Professor of Materia Medica and Therapeutics in the Chicago Homœopathic College).

This drug was introduced to the Homœopathic School in the first edition of my *New Remedies*, in 1862. We had no provings of it at that time. I collected all the clinical testimony available, and for several years it was used to some extent empirically. In my second edition it appeared with additional clinical observations (1867). In 1868 it was proved by Drs. Merriman and J. M. Cunningham. These provings appeared in the Trans. Hom. Med. Soc. of the State of New York. These provers experimented with the tinctures of the fresh plant, which made the provings reliable. In our practice the tincture is generally used, although some have used the Oil of Fireweed, supposing it to be Oil of Erechtites, which is generally a doubtful supposition.[†] Chemists inform us that these oils are chemically identical with turpentine, but their physiological effects differ. The same has been said of Caffeine and Theine, but it has been disproved by Prof. May.

It is not to be denied that Erigeron, Erechtites, Turpentine and Senecio have very similar pathogenetic remedial effects. The Oil of Savin is closely allied to them, as is Thuja and Pinus Canadensis. The doses of the tincture taken by the provers, range from 10 to 200 drops, not sufficient to cause severe pathogenetic or toxic effects. The headache it caused was just such as precedes *Epistaxis*. The action on the kidneys and bladder stopped just short of inflammation. It greatly increased the flow of urine, which was acid, and contained a large amount of flocculent mucus. The sphere of action of this drug is the *vascular system*. It increases the action of the heart, and causes congestion of the head, lungs, kidneys and uterus, and in continued toxic doses would doubtless cause hemorrhages from all these organs. Like turpentine, it causes two kinds of hemorrhage, the active and passive. The former is an acute primary effect, the latter secondary, due to loss of tone in the extreme blood-vessels.

When given for acute hemorrhages (arterial), the dose should be small (2nd dil). When for passive hemorrhage, the drug can be safely given with benefit in doses of ʒi to ℥j of the tincture. If the true Oil of Erechtites is given, the dose should not exceed 5 to 10 gtts. The specific indication for its use in acute hemorrhages, is the bright, florid character of the arterial blood, with evident excitement of the circulation. In passive hemorrhages, the blood may be dark and grumous, with an appearance of lack of fibrin, and disorganization of the globules. Epistaxis, Hæmoptysis, Hæmatemesis, Hæmaturia, and hemorrhage from the uterus and bowels are all controlled by this remedy. I have found in useful also in irritability of the bladder, with dysuria, and mucus in the urine. In menorrhagia and metrorrhagia it will act very promptly. In large doses it will increase the menses, and bring them on before time, but it should be used continuously, and only in torpid, cold, and phlegmatic persons.

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[*] The name, *Fireweed*, led some persons to infer that the oil was intended to be a dressing for *burns*, and led to its employment in cerates for that purpose. It has considerable use in that direction, but in semi-proprietary form, and not by the medical profession. That it is not objectionable is evident. This reminds us of the plant, *Hepatica triloba*, that came into extended use as a "*liver remedy*," not from any value of itself, but by mistake for the true *liverwort*. (See Vol. I., p. 46.)

[†] It has been shown in our paper that commercial Oil of Fireweed is Oil of Erigeron.—{*L.*

It causes burning in the stomach, with gastralgia, nausea and vomiting colic and yellow diarrhœa—worse in the morning. I have often cured just such gastro-intestinal derangements with the first dilution. In dysentery, with pure blood stools, it has been used with benefit. Gonorrhœa and gleet have been cured by it when the discharge is scanty and bloody, and very painful. In orchitis it is almost specific, equalling clematis or pulsatilla. In the tympanites of typhoid fever, I have often used the oil (what I supposed to be the Oil of Erechtites), with a success as good as I ever gained from Terebinthina.

CAULOPHYLLUM.

BLUE COHOSH.

PARTS USED.—The rhizomes and roots of Caulophyllum thalictroides, *Michaux*.

Natural Order Berberideæ, Tribe Berbereæ.

COMMON NAMES.—The correct common name for this plant is Blue Cohosh, and by this name it is usually designated in the drug trade. It was introduced by Rafinesque in 1828. The plant having been used by the Indians was called Cohosh[*] in common with a number of other plants. Pursh (1814) states to this effect, and the name, Cohosh, is used by Barton in 1818. Through the series of Eaton's Manuals (1816-40) it is called False Cohosh, Eaton designating as Cohosh, Cimicifuga racemosa, now known as black cohosh. Rafinesque suggested that the name Blue Cohosh was the most suitable name for the plant, it having a blue aspect and blue berries, and the name cohosh having been fixed by the Indians. Gray's and Wood's Manuals adopted this name and it has become established, and as stated before, is now the name usually used in the drug trade.

Next in importance to this name is Squaw Root or Pappoose Root (spelled also Poppoose Root) names that were introduced by Smith,[†] an "Indian doctor," who states that the squaws owe the facility of their parturition to the constant use of this rhizome for two or three weeks before their confinement. These names are now also occasionally used in commerce.

Only these three names are of any importance, but in addition we find the following occasionally applied to the plant; Blueberry, by which Rafinesque states the plant was called in some sections and the application of which is natural from the deep blue berries; Yellow Ginseng and Blue Ginseng, names given to the rhizome from a supposed resemblance to Ginseng, but which are not warranted by facts and now luckily are not continued; Lion's foot a literal translation of the old generic name, used by Forester (1777) who merely copied the name from the Greek species of Leontice, but it has no application or sense when applied to the American plant; Columbine-leaved Leontice and Meadow-Rue Leontice are names used in old botanical works, translations of the botanical names, but are never applied now.

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[*] Regarding the meaning of this word in the Indian language, Mr. W. R. Gerard writes as follows:

"The Algonkin word, *Cohosh*, applied by the whites to several plants, smooth in all their parts, means 'it is rough' (with hairs). Among the Montagnais of Canada this name is applied to the bristly fruit of *Ribes lacustre*. I cannot conjecture why the Indians should have applied it to the plants that now bear it, and I very much doubt whether they ever did so."

[†] Peter Smith was an "Indian herb doctor," residing in Cincinnati during the early part of this century. He was a shrewd advertiser, and issued his "Medical Facts" from Cincinnati in 1813. His history is embraced in the above note, for, all our endeavors to derive further light regarding the individual have been fruitless. Doubtless he was one of the eccentric characters, typical of those now familiar, but who vanish with their advertisements.

In endeavoring to find a record of the history of this individual, the Cincinnati publications of that day were carefully examined, and every endeavor made to find a person who remembered him. It is a little curious that, in this city, all trace has vanished of this man to whom Rafinesque referred to as authority. We are familiar with many persons who should bear witness, but none remember him.

Botanical Description.—Blue Cohosh grows about two feet high, and is found in rich, open woods. It does not form patches, but the plants are generally few together, and distributed through the woods at the bases of trees and similar rich, shady situations.

The plant in April produces a terminal cluster of small greenish-yellow flowers, which being about the same hue as the leaves are not likely to attract much attention. At that time the leaves are only partly grown, but they mature rapidly, and before the plant is out of bloom they are full size.

The rhizome is the portion used in medicine. It is knotted, branched, and has numerous fibrous roots. It sends up in early spring, one, sometimes more, simple, erect stems, naked below, excepting a sheath at the base, and bearing above two* ternately compound leaves and a small terminal raceme of flowers. It appears as though the stem was merely the leaf stalk.†

The lower leaf is much the larger, triternate, and usually with no common petiole.‡ The stem above this leaf is much smaller than below and appears to proceed from the leaf. The leaflets are one to two inches long, obovate-cuneate, tapering and entire to the base, three-lobed above. The lobe subequal, terminating in short abrupt points. The side lobes are usually entire, the middle lobe two-toothed. The leaves as well as the stem and all portions of the plant are perfectly smooth, and covered especially beneath with a glaucous, blue, bloom, which gives the plant a bluish aspect, and, hence, it is called Blue Cohosh.

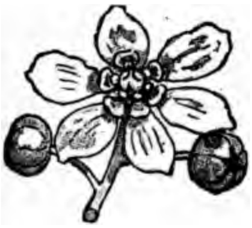

Fig. 158.

A flower and two buds of Caulophyllum thalictroides, (slightly enlarged).

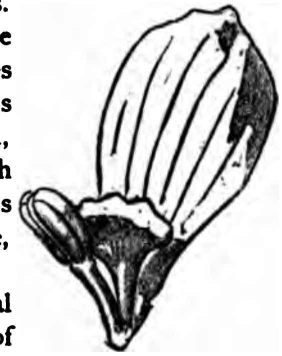

Fig. 159.

A stamen, petal and sepal of Caulophyllum thalictroides in natural position (enlarged).

The flowers are in a terminal panicle about two inches long. They are one-third of an inch in diameter, and yellowish green color, and are borne each on a short slender bracted pedicle.

There are three small linear bracts, appressed to the flower. The sepals are six, equal spreading, one-quarter of an inch long, obtuse, yellowish green color, and are arranged in two series. Opposite each sepal and at its inner base there is a thick, wedge-shaped, gland-like organ, called the petal by most recent botanists. These are very much smaller and shorter than the sepals and they secrete the honey.§

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*Some writers describe the plant as usually only having one leaf, but we have never noticed a specimen where both leaves were not present.

†Michaux who named it, states in substance that the name is from the leaf, being as it were, the continuation of the petiole-formed stem.

‡Sometimes we have found a short common petiole.

§Botanists have different views and names for the floral envelopes of this plant. By some the three linear outer are sepals, the next six large leaves are petals, and the six inner organs, glands, called by Nuttall "lepanthia,", and by Linnæus "nectaries." Recent writers describe them as we have given them, the exterior three, bracts, the large leaves, sepals, and the gland-like organs, petals.

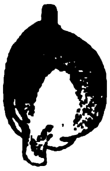

FIG 160.
Pistil of Caulophyllum thalictroides.

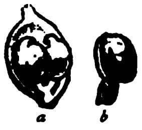

FIG. 161.
a, the two ovules in position; b, a single ovule. Caulophyllum thalictroides.

The stamens are six, small, about the length of the petals. They have short thick filaments and two oblong anther cells attached extrorsely, and opening by two valves hinged at the top. The stamens are opposite the petals, and, hence, in the flower we have sepals, petals and stamens, equal in number and opposite each other, an arrangement that is very rare.

The pistil is solitary. It consists of a globose one-celled ovary, with a short-pointed stigma. The ovules are two, and erect, borne on separate seed-stalks (funiculi) from the base of the ovary.

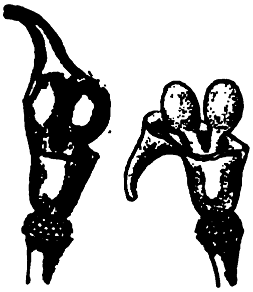

FIG. 162.
Illustrations of the young pericarps of Caulophyllum thalictroides, being ruptured by the ovules.

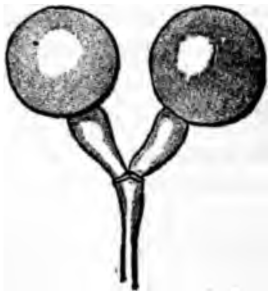

FIG. 163.
Fruit of Caulophyllum thalictroides, (natural size).

Shortly after flowering the thin walls of the ovary are ruptured by the growing ovules and shrivel away. The seeds therefore ripen naked without any covering, a peculiar arrangement that was first noticed by an observing English botanist, Robert Brown. This is a very peculiar habit, and does not occur to our knowledge in any other native plant,[*] excepting of course, the gymnosperms, or coniferous trees, in which the pericarp is entirely wanting. Our figure 162[†] shows the ovaries at the stage of rupture. When the seed mature they are of a deep blue color, perfectly round and borne on the thickened seed stalks. They have every appearance of a drupe and were so described by the earliest botanists. The albumen is horny and a vertical section has a reniform appearance.

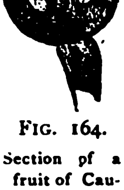

FIG. 164.
Section of a fruit of Caulophyllum thalictroides.

BOTANICAL HISTORY:—In order to obtain a clear idea of the generic history of this plant we have to begin with the work of Tournefort (1700), who established a genus which he called Leontopetalon and included two plants native of the Levant and Greece, known to botanists now as Leontice Chrysogonum and Leontice Leontopetalon.[‡] It was from the latter that the name was derived from a fancied resemblance of the leaflet to a lion's foot.[§] The American plant was not then known, but no doubt would have been included by Tournefort in this genus.

Linnæus (1737)[‖] substituted the name Leontice for the genus. This name in Greek was used by Dioscorides, Pliny and other ancient writers, but the plant to which it was applied is not now known. We can not say whether Linnæus contracted Tournefort's name Leontopetalon to Leontice as stated by some, or whether he took the name Leontice from Greek or Latin writers and substituted it; the latter is, we think, the more probable.

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[*] Many plants with what are called naked seeds are in reality perfect fruit with the pericarp cohering with the seed and called a caryopsis, or with the pericarp hard, indehiscent, and appearing like a seed and called an achene.

[†] Copied, as are also Figs. 163–164, from "Gray's Genera," plate 32.

[‡] Tournefort had a personal acquaintance with both of these plants having spent two years traveling in the Levant. His plate (484) very accurately shows the six petaled flowers and the inflated triangular pod containing about four seeds.

[§] From λέων a lion and πούς a foot. This same name in Greek was applied by Pliny to some plant which can not be identified from his descriptions.

[‖] Genera Plantarum, edition 1st, p. 94.

That Linnæus was then acquainted with the American plant is likely, as specimens had previously been sent over by Clayton,[*] but it is evident that he was not familiar with its fruit, as he describes the fruit of the genus as "Capsule large, globose, sharp, inflated, one-celled, sub-succulent," which applies to the two European species but not to our plant.

The genus belongs and was placed in the Linnæan class, "Hexandria Monogynia" which brings with it many Liliaceous and other endogenous genera, a most unnatural alliance according to our present classification.

The first published record of the plant is by Gronovius (1739)[†], the next by Colden (1743).[‡]

In the first edition of Species Plantarum,[§] the plant was called Leontice thalictroides,[‖] and with three other species constituted the genus.[¶] Under this name the plant was described in all botanical works up to the beginning of the present century.

In 1803 there was published in Paris the Flora Boreali-americana, a description of the plants collected by the elder Michaux in America, and in this work there was established for the plant a new genus Caulophyllum[**] differing from the Leontice of Linnæus in the character of the fruit. It seems that Michaux observed that the mature fruit was not a membranous capsule as the fruit of the genus is described in the Genera Plantarum of Linnæus, but as he supposed a drupe, and he called the plant Caulophyllum thalictroides. It is worthy of note that this is an incorrect view of this fruit (See description; Page 143), and that this genus was founded under a misapprehension of its nature and now that this is understood it is a question whether there is any structural reason for continuing the genus.

Nuttall, Pursh, Barton, Eaton and other writers immediately following Michaux, adopted his nomenclature of the plant, but in 1816, in a paper read before the Linnæan Society,[††] Robert Brown demonstrated the erroneous views of Michaux, and showed that the plant only differed from the genus of Linnæus in the duration of the pericarp and questioned whether this alone was sufficient to entitle it to generic rank, especially when other plants are known with fruit char-

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[*] See note *, p. 30, also following note ‡

[†] Flora Virginica, p. 151, under the name "Leontice foliis supra decompositis."

The plant was sent to Gronovius by Clayton (see note *, p. 30), under the name Christophoriana which was a kind of family name applied by old writers to a number of plants with triternate leaves. (See vol. 1, p. 233.)

[‡] Plantæ Coldenghamiæ, published in 1743-4 in the transactions of the Royal Society of Science at Upsal.

Cadwallader Colden was of Scotch descent, his father being a minister in the church of Scotland. He was educated at the University of Edinburgh, learning there the rudiments of botany. His father intended him for a minister, but the salary being small he studied medicine. He had a sister in Philadelphia, and in 1710 he emigrated to this country to try his fortune. He became acquainted with General Hunter, of New York City, who tendered him a public position in 1718 which he accepted, moving his family to New York. He settled about the year 1739 in the wilds along the Hudson on a tract of land to which he had secured a government patent under the name Coldingham. This was then on the very frontier to the Indians and an absolute wilderness.

Although always of a philosophical turn of mind he gave no special attention to plants until about 1740, when coming into possession of the then recent Genera Plantarum of Linnæus, he became much interested in studying the plants growing around his neighborhood, the methods of Linnæus affording an easy means of classification. In 1742 he made a collection and description of the plants and sent them to Gronovius who in turn transmitted them to Linnæus who published the first part of it (to the end of class Polyandria) in the Transactions of the Royal Society at Upsal, for the years 1743-4, under the title "Plantæ Coldinghamiæ in Provincia Noveboracensi Americæ sponte crescentes, etc." The remainder of the work was never published but is preserved in the Banksian library. In this effort to classify American plants, Colden was unassisted by previous work or co-worker and considering the difficulties under which it was written it is a remarkable production.

In the latter part of his life, Colden was elected Governor of New York State. He died at the age of eighty-nine years.

[§] Species Plantarum, Linnæus, 1743, ed. 1, p. 312.

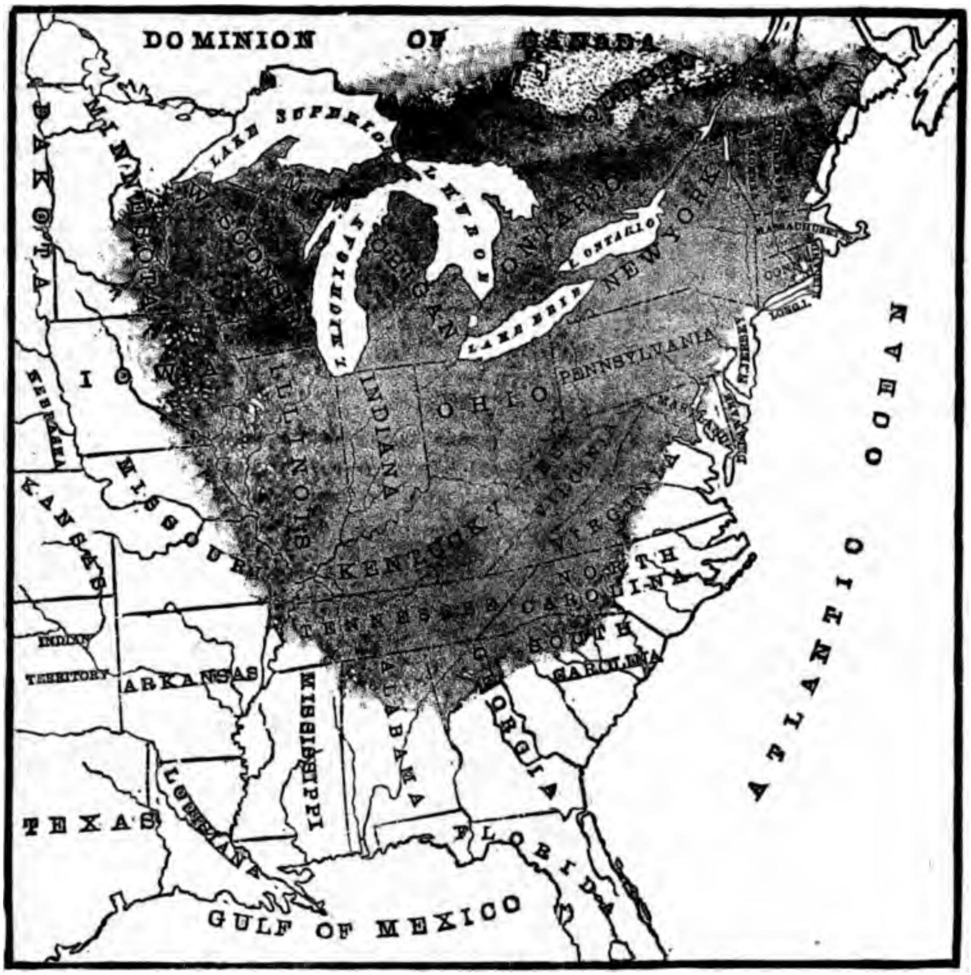
[‖] This name has reference to the resemblance of the leaves to those of the genus Thalictrum. It was applied by Linnæus as a specific name also to Anemone thalictroides for the same reason.

[¶] These are Leontice Chrysogonum and Leontice Leontopetalon (previously refered to), and a plant from India called Leontice Leontopetaloides by Linnæus but which now we are unable to locate. It is however no longer included in the genus Leontice.

[**] The derivation of the name Caulophyllum given by its author is from καυλός a *stem* and φύλλον a *leaf*, because the leaf stem is apparently a continuation of the stem of the plant.

[††] "On some remarkable Deviations from the usual structure of Seeds and Fruits," By Robt. Brown, F. R. S. Read before the Linnæan Society, London, March 5, 1816, and published in the Transactions of the Linnæan Society, Vol. XII., 1818, p. 143.

PLATE XL.



MAP SHOWING THE GEOGRAPHICAL DISTRIBUTION OF CAULOPYYLLUM THALICTROIDES.

Compiled from Reports of Botanists in All Sections of the Country.

acters intermediate between it and the typical genus.[*] De Candolle, Endlicher, Baillon and most botanists of Europe, andTorrey of this country, have reunited the plant with the Linnæan genus; Bentham and Hooker, Gray, Watson and other American botanists consider it distinct. Several botanists seem to have been undecided how to classify it. Wood in first edition of his manual, Gray in first edition of his class book, Darlington in first edition of Flora Cestrica, all call it Leontice, in latter editions however all change to Caulophyllum.

It seems to us that the views can be classified into four distinct eras. First, the Linnæan, from its discovery to 1803, when the plant was classified from characters drawn from European species.

Second, the era of Michaux, 1803 to 1816, when it was classified from an erroneous view of the nature of its fruit.

Third, the era of Brown, 1816 to about 1856, when it was mostly reunited with Leontice, because theoretically there is no structural difference.

Fourth, the era of Gray, beginning with the second edition of his manual 1856, and extending to the present day, and considering the early rupture of the pericarp and the maturing of the naked seed sufficient for generic rank.

As thus viewed the genus includes, as far as known, only this one species native of this country, and also of Japan.

GEOGRAPHICAL DESCRIPTION.—Blue Cohosh is of wide range in this country, extending from New Brunswick on the north to the southern limit of the Allegheny mountains and the Mississippi Valley on the west. It is generally distributed over this country where conditions are found suitable to its growth, which are rich, shady woods, and deep loam. It is absent from low, flat, marshy districts, along the coast and from prairie regions.

In Canada, it occurs sparingly in New Brunswick, and is found along the St. John's River, It is abundantly in the southern portion of Ontario.

In the New England States it is found in the hilly and mountainous districts, but is absent from the open country along the ocean.[†]

Throughout New York and Pennsylvania it is found in woods, and is common in the hilly and mountainous districts.[‡]

In New Jersey and Delaware it is only found, and but rarely, in the eastern and northern sections. It is entirely absent from the peculiar swamp regions of New Jersey.

It is abundant throughout the Allegheny mountains, extending south, but with the exceptions of these mountains and their connecting spurs and hills, it is not found in the Southern States, being absent from the gulf and coast regions

Over Tennessee, Kentucky, West Virginia, Ohio, Indiana and the southern portion of Michigan, it is common, being usually found in woods suited to its growth.

Throughout Illinois and lower Wisconsin it is rare, or absent, especially from prairie districts. It is found in a few eastern localities in Missouri, Iowa and Minnesota, but does not occur west of these States.

DESCRIPTION OF THE DRUG.—The part used in medicine is the dried rhizomes with the attached roots. As found in commerce, they are usually two to four inches long (sometimes larger), and one-quarter of an inch thick. They are much curved, and irregular in shape, and are marked on the upper side, at irregular intervals, with large cup-shaped scars, left by fallen stems and leaves. These scars are usually ragged from the woody zone of the base of the stems. The rhizome breaks with a tough, woody fracture, and is light colored within. The wood zone is separated by large medullary rays into separate, splinter-like, thin, flattened bundles, which make the fracture of the drug irregular, and these wood bundles are easily separated from each other. The rhizome bears many fibrous roots; these are slender, sparingly branched, light brown color, and are always found in large numbers attached to the rhizome of commerce. They are not brittle, and do not easily rub off.

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[*] These are Leontice Eversmanni Bge. and Leontice altaica Pall. The capsules break open at the top in these species when the fruit is only half grown, and the seeds ripen naked, the only difference between them and our species is that they are surrounded by the sides of the bursted capsule and in our species the capsule being ruptured earlier, the seeds ripen entirely naked.

[†] It is marked "common" in Perkin's Flora of Vermont, and is mentioned in other New England lists but it, must be rare over all the New England States, as it was not reported by any of twenty-five botanists in these States who favored us with indigenous lists of plants. The inquiry was made. however, under the name, Leontice thalictroides, a name that is not familiar to the present average botanist, which may be the reason some failed to report it.

[‡] It does not occur on Long Island, and is very rare in the valley of the Hudson, though found in the mountains adjacent. It is rare in southeastern Pennsylvania, and around Philadelphia.

The impression imparted by chewing the drug is an intense acridity, and the dust irritates the mucous membranes of the nostrils and eyes, exciting secretions from those surfaces and violent sneezing. From sensible resemblance of the drug to that of saponin yielding plants, and from the similarity of one of its constituents to saponin, writers have been led to assert that the acrid principle is saponin.*

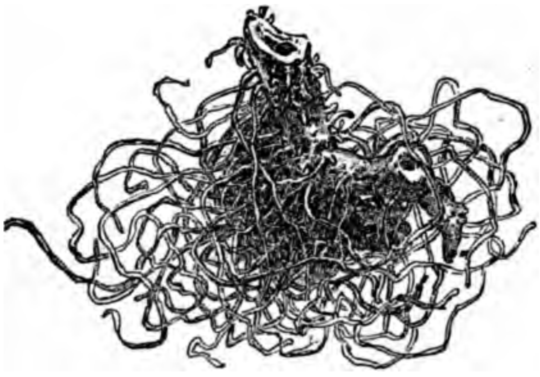

FIG. 165.
Dried Rhizome of Caulophyllum thalictroides (small size).

Sophisticatıons.—To persons familiar with the drug, substitution is easily discovered, but, with ordinary observers, one other commercial drug would be distinguished with difficulty, if at all. We refer to the rhizome of Jeffersonia diphylla or, twin leaf, and, we know from experience, that care must be exercised to avoid admixtures, or even entire lots of one being thrust forward as the other. The drugs in the mass look very much alike, and can be distinguished only by a close examination. *There is no perceptible difference* in taste, both being acrid, so-called saponin yielding drugs. We therefore shall endeavor to give descriptions that will enable the reader to easily distinguish them.

CAULOPHYLLUM. BLUE COHOSH.	JEFFERSONIA. TWIN LEAF.
Rhizome prominent, the roots only partly concealing it. Rhizome from one-fourth to one-third an inch in diameter, and from four to six inches long.	Rhizome obscured, almost entirely covered with a mat of roots. Rhizome about one-fourth an inch in diameter, and but an inch or two in extent. It is covered with a clump of roots more extensive than surrounds the larger rhizome of Caulophyllum.
The broken rhizome and root are of a dead, ashy color.	The broken rhizome is distinctly yellow or greenish color.
The roots are smooth, evenly curved, and have but few branches.	The roots are contorted, especially near the extremity, and give rise to numbers of wiry branches which, associated with the others, nearly hide the rhizome.

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*See chemical constituents, p. —.

COMMERCIAL HISTORY.—There has been some little demand for Caulophyllum since 1813, but almost altogether in domestic medicine for making infusions and decoctions, until 1852; then the Eclectic Dispensatory appeared and Prof. King introduced the drug and some preparations of it. This was followed by a demand among Eclectics, which has continually increased until the present time.

Now, it is of some importance, although still practically unknown in Regular practice; probably twenty-five thousand pounds are annually consumed. It appears in commerce in bags, and, owing to the wide territory over which the plant is distributed, the drug is but little shipped, being mostly collected by local collectors near cities in which it is used. It is often of questionable value, owing to dirt adhering to the fibers and to admixtures (see adulterations.) It is principally consumed in the preparation of fluid extract of Caulophyllum, and the pharmaceutical preparations we mention in that part of this publication devoted to the subject.

PHARMACOPŒIAL HISTORY.—Throughout an increasing commercial demand for Caulophyllum, from the date of the first issue of the United States Pharmacopœia (1820 to 1870), the drug remained unrecognized. In 1882 the committee wisely introduced it, but omitted any pharmaceutical preparation. Notwithstanding its neglect by the Regular medical profession, we feel that it is more important than some drugs considered in detail, and we trust to find the next revision of our pharmacopœia introduce at least a process for making fluid extract of Caulophyllum.

PHARMACEUTICAL PREPARATIONS.—The only pharmaceutical preparations are those that are employed by Eclectic physicians.

Fluid Extract of Caulophyllum.—

Take of Caulophyllum, powdered, sixteen parts;
Alcohol,
Water, of each, a sufficient quantity.

Mix three parts, by measure, of alcohol with two parts of water; moisten the powder with this mixture and properly pack into a cylindrical percolator. Reserve the first fourteen parts of the percolate, and having continued the percolation until the drug is exhausted, evaporate the latter portion to two parts, and mix the residue with the reserved fourteen parts.

This formula has been employed by us for some years, and will give satisfaction, both as regards the pharmaceutical preparation and its therapeutic action.

Dose.—The fluid extract is administered in doses of from five to fifteen drops, in accordance with the view of the physician or the condition of the patient (See Medical Uses).

Compound Tincture of Caulophyllum.[*]—

Take of Caulophyllum, in powder, four parts;
Ergot,
Water Pepper, of each two parts;
Oil of Savin, one part;
Alcohol, a sufficient quantity.

Percolate the mixed powders with alcohol, in the usual manner, until forty-eight parts of tincture are obtained. In this dissolve the Oil of Savin.

Dr. King states that this forms an emmenagogue tincture, very useful in amenorrhœa, dysmenorrhœa and other uterine affections. The dose is from fifteen drops to a fluid drachm, two or three times a day.

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[*] American Dispensatory, p. 1218.

This preparation was originated by Prof. King, with whom Caulophyllum is a favorite. It was more extensively employed in former years than at present, but is still used by Eclectic physicians.

Compound Syrup of Mitchella (Mother's Cordial).—

Take of Mitchella, eight parts;
Helonias,
Viburnum Opulus,
Caulophyllum, of each, four parts.

Percolate the mixed drugs, in form of powder, in the usual manner, with brandy, until forty-eight parts are obtained. To this add thirty-two parts of sugar, and continue the percolation with water until one hundred and twenty-eight parts in all have been obtained, including the dissolved sugar. Lastly, flavor the syrupy liquid with Essence of Sassafras, if desired.[*]

Dr. King states that this preparation is a uterine tonic and antispasmodic. It may be used in all cases where the functions of the internal reproductive organs are deranged, as in amenorrhœa, dysmenorrhœa, menorrhagia, leucorrhœa, and to overcome the tendency to habitual abortion. The dose is from one to four fluid ounces, three times a day.

Compound Syrup of Mitchella is in considerable demand. It is used more extensively than all other compounds of Caulophyllum, and Eclectic physicians retain it in confidence, although rapidly discarding such mixtures. It is an exclusively Eclectic remedy.

Resinoid or Concentration (Caulophyllin)[†].—Prof. John King discovered Podophyllin in the year 1835, and immediately following its introduction, other bodies appeared under such names as Macrotin,[‡] Hydrastin,[§] Caulophyllin, etc. They were supposed to be produced by the method employed in making "Podophyllin," but manufacturers often found it necessary to deviate from the original plan. Some drugs furnished small precipitates, and, often the characteristic part remained in solution. Other precipitates were oily and refused to dry. Thus each maker became a law unto himself, and the names at present embrace many substances of various natures.

Caulophyllin was once supposed to have been made by precipitation of an alcoholic tincture of Caulophyllum,[‖] but we can find no evidence from a manufacturer to support that view.[¶] We have not been able to produce a satisfactory preparation by that method, and, we are in a position to know the demands of trade.

In order to produce a marketable preparation, it is necessary to exclude the glucose and gums of the plant, as nearly as possible, and the oily body that interferes with the drying of the product. In our hands the following process has proved acceptable, and we offer it without further comment than to say, we do not know that others use this process or method:

Preparation.—Percolate the powdered drug with alcohol, s. g. 0.820, and distil the percolate to a syrupy consistence; pour the residue into ten times its bulk of *cold* water.[**] Drain the precipitate, and while in the form of magma, wash it by violent agitation in a bottle or can, with an excess (about five times its bulk) of sulphuric ether.[††] The ethereal liquid is decanted, the precipitate drained and pressed; then it is mixed with a sufficient amount of powdered Caulophyllum to enable the operator to break it into friable fragments, and is dried by exposure to the air, and then powdered.

As thus made, Caulophyllin is in a powder of a grayish or brown color, and possesses the taste of the drug. It was once much used by Eclectic physicians, and is still in considerable demand.

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[*] This process is after the American Dispensatory, but modified, as has been found necessary in our hands.

[†] For a paper on American Concentrations or Resinoids, by J. U. Lloyd, see Pharmaceutische Rundschau, May, 1887, p. 105.

[‡] See Vol. I., p. 268.

[§] See Vol. I., p. 98.

[‖] See Mr. Ebert's paper, American Journal of Pharmacy, 1864, p. 203.

[¶] We believe that the information at our command is sufficient to place beyond doubt the fact that Caulophyllin is not made by simple precipitation.

[**] The water dissolves the glucose, and some extractive matter.

[††] This separates oils and fats. Benzine has been tried by us, but the odor is persistently held by the magma, and refuses to separate even by drying.

CONSTITUENTS.—Prof. F. F. Mayer (1863)[*] briefly states that the alcoholic tincture of Caulophyllum deposits by spontaneous evaporation "a white, granular substance in considerable quantity." He states that upon washing this precipitate with dilute acid, and then with water, it became grayish white, and could be powdered; consisting for the greater part of *Saponin*.[†] He also decided that the acid and watery washings contained a colorless alkaloid.

Mr. A. E. Ebert (1864)[‡] next examined the plant, making the only careful analysis that had been made to his day, and none has been since announced. Mr. Ebert obtained the ordinary constituents of plants, such as albumen, gum, starch, coloring matters, phosphates and sulphates of lime, and silica, together with a resin and a substance (identified and called saponin by Mayer) similar to saponin. Mr. Ebert failed to obtain an alkaloid and inferred that Prof. Mayer had employed a drug that was contaminated with hydrastis or other alkaloid yielding plants. The only substance of interest proved to be the resinous saponin-like body.

Our examination of the drug establishes, we think, that Mr. Ebert was correct in stating that this is the characteristic principle, obtained by him as follows: He poured an alcoholic tincture of the drug into water, obtaining thereby a precipitate that was largely insoluble in water and ether, and when washed with these menstruums and dried, and then dissolved in alcohol and evaporated, yielded a light brown body, that Mr. Ebert classed with the resins. He also obtained from the ethereal washings a similar substance, because, while this body is insoluble in ether, when pure, an ethereal preparation of the plant will dissolve it in appreciable amounts.

The water in which the alcoholic tincture had been precipitated yielded by evaporation, an extract, bitter and acrid, soluble in alcohol, and producing with water, a heavy froth. It was purified by solution in alcohol, treatment with animal charcoal and then filtration. The filtrate upon being mixed with sulphuric ether, gave a white precipitate that, upon drying, possessed the following properties:

Its taste was sweetish, then acrid, it irritated the nostrils, and produced sneezing. It dissolved in dilute and strong alcohol, also, in alkaline watery liquids. It precipitated both acetate and basic acetate of lead, mercuric nitrate and auric chloride. With warm sulphuric acid it first assumed a rose, then a purple, and finally a violet color. Nitric acid turned it yellow; hydrochloric acid did not change its color.

From a consideration of these tests Mr. Ebert stated that it was "a substance similar to saponin." We call attention to the fact that while most writers state that Mr. Ebert claimed to have identified *saponin* in Caulophyllum, he really said "a substance similar to saponin," and in another place, "a body analogous to *saponin*," but did not assert its identity with saponin.[§]

We have purified and obtained the characteristic portion of this Caulophyllum product, in snow-white, silky crystals, and we can therefore describe its color reactions, solubilities, and other properties with an exactness that was not possible in Mr. Ebert's case, for the apparently white amorphous precipitate used by him, we find to contain considerable foreign matter that is excluded by several crystallizations[‖]. We are not aware that any of the so-called saponin yielding plants have relinquished a material like this; certainly it is not saponin, as saponin is now accepted, and we therefore give it the name Leontin.[¶]

Preparation of Leontin.—If an alcoholic percolate of the drug be mixed with water, a grayish-white precipitate forms, that upon being collected on a filter, assumes a gelatinous magma-like condition. When dried, this precipitate has an acrid taste, and irritates the mouth and fauces. It is mostly soluble in alcohol, insoluble in water; soluble in alkaline water, insoluble in chloroform and ether. If it be dried it assumes a dark color and then is not altogether redissolved by alcohol.

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[*] American Journal of Pharmacy, 1863, p. 99.

[†] If this is Saponin, we have crystallized it.

[‡] American Journal of Pharmacy, 1864, p. 203.

[§] We pass the saponin subject, proposing to consider it in detail when we come to other so-called saponin yielding plants.

[‖] We call attention to the fact that our determinations with the reagents Mr. Ebert used, agree with him as nearly as is possible under the circumstances, and leave no question as to the fact that Mr. Ebert obtained amorphous Leontin, although he lost the larger part of it in his manipulations, and it was not strictly pure. To Mr. Ebert, we think, should be awarded the credit of its discovery.

[¶] The name (Leontin) is affixed by us to this body in consequence of the fact that the more appropriate term, *Caulophyllin*, is already appropriated by an Eclectic concentration (see p. 150). We feel therefore that in order to maintain a plant relationship we can, perhaps, not improve upon this name derived from the old botanical name of the plant. In time to come, when the relationships of plant constituents are understood, a few names will probably answer for the many now given.

This is the substance that Mr. Ebert considered a resin, and it is the substance that separates slowly in the form of a gelatinous magma from hydro-alcoholic preparations of Blue Cohosh, especially if they are of less than 50 per cent alcohol. It is at first sweetish, then acrid, leaving an after-taste resembling Senega, and an irritation of the throat and fauces. It is odorless, but the dust produces an irritation of the nostrils that excites sneezing. From its solution in alcohol, water precipitates it gelatinous; from its solution in alkaline water, acids precipitate it gelatinous. In both instances the magma has no crystalline structure.

If this substance be dissolved in alcohol, a dark brown solution is produced in consequence of impurities of a resinous nature, and it refuses to separate or crystallize from that alcoholic solution. If, however, it be first treated with cold anhydrous alcohol, coloring matters are extracted. If the alcohol is then filtered, the residue will, if dissolved in boiling alcohol, crystallize in silky, needle-like crystals upon cooling the solution. If the hot solution be concentrated, it forms a soft, silky, needle-like mass; if it be more dilute, the crystals slowly separate in acicular tufts, clear and distinct. They have a brown color, but upon re-crystallizing them from alcohol, become perfectly white and of a beautiful, satin-like lustre. When purified they easily crystallize from hot alcohol.

Properties of Leontin.—As obtained by the process we have given, Leontin is in pure white, feathery crystals, resembling quinine. It is a glucosid, and upon boiling with diluted acids, splits into glucose and a gelatinous, colorless body, that is insoluble in water, but soluble in alkaline water and in alcohol.

Leontin is slightly soluble in cold alcohol (s. g. 0.820), very soluble in boiling alcohol, crystallizing from it in needles upon cooling. It is slightly soluble in cold anhydrous alcohol, very soluble in boiling anhydrous alcohol, crystallizing in needles upon cooling, and the most perfect crystals are obtained from absolute alcohol.

It is slightly soluble in cold sulphuric ether (U. S. P.), quite soluble in boiling sulphuric ether, crystallizing from it in needles upon cooling. It is practically insoluble in cold and boiling chloroform

All solutions of Leontin are colorless.

Leontin is insoluble in water, and the addition of water to its solution in alcohol, results in immediate precipitation. Alkaline water dissolves Leontin freely, acids precipitating a gelatinous magma somewhat altered in properties from the original substance.

Leontin is tasteless, but, owing to the alkaline nature of saliva, slowly dissolves, leaving an acrid after-taste. It is odorless, but its dust is acrid, imparting an irritation, like saponin, to the nostrils. Its solution in alcohol is acrid to the taste, and its solution in alkaline water is *very* acrid and irritating to the mouth and fauces.

Leontin does not neutralize alkalies, and its solution, even if dilute, forms much froth when shaken.

Color Tests.—Upon placing a drop of concentrated nitric acid upon a porcelain slab, and dropping a tuft of crystals of Leontin into it, they develop a pale rose color that disappears as the acid evaporates, leaving a white crystalline magma. Upon adding a little Leontin to a few drops of nitric acid in a test tube, and then gently warming the mixture, the color passes to pale rose and then yellow; when the liquid is cool, a white flocculent precipitate separates, that redissolves upon warming. The addition of water precipitates it white, and this precipitate dissolves in ammonia.

Sulphuric acid dissolves it slowly, forming at first a colorless liquid, if the Leontin is in small amount, but, if the proportion of Leontin is considerable, effervescence follows, and an orange color is developed, which passes to rose, and finally into a deep purple. Upon gently warming a small crystal of Leontin with a drop of concentrated sulphuric acid in a test tube, it develops a beautiful rose color, passing into crimson, and then assuming a deep purple. If the liquid be heated in the flame of a spirit lamp, the color disappears, a carbonaceous mass remaining.

This color test is extremely delicate, a crystal of Leontin so small that it failed to affect our most delicate balance (less than 1,000 of a grain), developing a decided rose color in a drop of warm sulphuric acid.

If to the purple or rose colored liquid formed by the reaction between sulphuric acid and Leontin, powdered bichromate of potassium be added cautiously, agitating after each addition until it dissolves, the color disappears, and a yellow liquid results. If a slight excess of bichromate of potassium is now added, an apple-green color is formed, which deepens by the addition of a further amount to a clear, deep green. If the bichromate of potassium is cautiously added to sulphuric acid tinged a rose color, by the addition of a *very* small amount of Leontin, the color disappears, the acid becoming colorless. These color reactions are very sensitive, characteristic and unmistakable.

Hydrochloric acid (cold) seems not to effect it, but if a small portion of Leontin is gently warmed with an excess of that acid, it effervesces, disappears and a colorless mucilage results. The production of this gelatinous material is remarkable for the viscosity resulting from a very small amount of Leontin.

The Ultimate Analysis of Leontin.—(Written for this publication by Prof. Henry Trimble, Professor of Analytical Chemistry of the Philadelphia College of Pharmacy).[*]

A portion of the finely powdered pure white crystals kept in a desiccator over sulphuric acid for several days, lost 15 per cent. This dried powder was then used in making four combustions with the following percentage results:

	1.	2.	3.	4.	Average.
C	60.35	60.77	60.87	60.11	60.52
H	8.92	8.49	8.70	8.68	8.70
O	30.73	30.74	30.43	31.21	30.70

On heating a portion of this same powder in an air bath to 110° C until it ceased to lose weight, there were found 5.62 per cent. of water: no further loss occurred on heating to 120°.

The compact formula which these figures most nearly represent is $C_{16}\ H_{26}\ O_6$ or if we suppose the 5.62 per cent. of water represents one molecule of H_2O, as it certainly does, we have $C_{16}\ H_{26}\ O_5\ H_2O$ as the formula of the substance dried at ordinary temperature over sulphuric acid. The following is a comparison in percentages:

	Found.	Calculated from $C_{16}\ H_{26}\ O_5\ H_2O$.
C	60.52	60.75
H	8.07	8.23
O	25.12	25.33
H_2O	5.62	5.69

Of known compounds this is the nearest in composition to parillin or sarsaparilla-saponin.

The opinions regarding this latter compound are somewhat various; the latest publication is that by Flückiger (Archiv. de Pharm. vii, p. 532), who found the mean of three analyses of parillin to be C=60.40, H=9.00, O=30.60, and in other samples he found somewhat smaller percentages of carbon. He suggests as a formula for these percentages $C_{48}\ H_{85}\ O_{18}$, which is very close to three times the formula $C_{16}\ H_{28}\ O_6$. Such a multiple would not, however, be compatible with 5.62 per cent. of water in combination, as there is in Leontin, since before drying at 110° all adhering moisture was removed in a desiccator. Neither is this formula of Leontin exactly in accordance with Flückiger's suggestion that all saponins have a general formula $C_n\ H_{2n-10}\ O_{18}$.

Other investigators have found parillin to have *about* the percentage composition given by Flückiger, but differ as much among themselves as from the figures given for Leontin. Parillin melts at 210° C, earlier investigators gave as low as 125°. Leontin remained unchanged until 231° to 233° C was reached, when it softened into a yellow mass, but did not completely melt.

Caulophylline.[†]—Prof. F. F. Mayer[‡] identified an alkaloid, and states that such was the case, in a positive manner. The alcoholic tincture was evaporated and the residue washed with dilute acid, "which dissolved a colorless alkaloid, and, soluble extractive matter.[§]

Ebert (1864)[‖] failed to crystallize an alkaloid, and inferred that the drug Mayer used must have contained hydrastis or other alkaloid yielding plant.[*] Our investigations show that Prof. Mayer was right in stating that an alkaloid existed in the plant, although he did not obtain it pure. Also that Mr. Ebert was misled by reason of the fact that he doubted its presence because it was uncrystallizable.[†]

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[*] The relationship between *Leontin* and *Parillin*, as shown by Prof. Trimble, is another link in that interesting series of the so-called saponins. In our paper we have endeavored to avoid the question of the connection between Leontin and Saponin, preferring to defer the matter until the other so-called saponin yielding plants have been considered. Prof. Trimble will continue these determinations and doubtless others also will become interested. We have deposited specimens of Leontin in the Philadelphia and Chicago College of Pharmacy Cabinets for future reference.—[*L.*

[†] Do not confuse this name with the term *Caulophyllin*, appropriated by the so-called resinoid. Probably the resinoid will disappear in time to come. The termination of the words *in* and *ine* will serve to distinguish them.

[‡] (See Leontin, p. 151) At this time Prof. Mayer was interested in the test for alkaloids, now known as Mayer's Test. He did *not* separate an alkaloid from Caulophyllum. He obtained a precipitate with his reagent from an aqueous solution of the plant, an uncertain reaction, perhaps, under the circumstances. Such authorities as Maisch did not deem it conclusive, as is shown by the National Dispensatory omitting the alkaloid.

[§] American Journal of Pharmacy, 1863, p. 99.

[‖] American Journal of Pharmacy, 1864, p. 203.

Preparation.—Tincture of Caulophyllum is to be evaporated to a syrupy consistence, acidulated slightly with hydrochloric acid and poured into a large volume of water; and after twenty-four hours filtered. The filtrate is to be evaporated to the consistence of a solid extract, and triturated with sulphuric ether, a little ammonia water being added to slight alkaline reaction. The ethereal liquid is filtered and evaporated in the presence of water, and, the watery liquid filtered. This gives an aqueous solution of the alkaloid which can be further purified by evaporation to dryness, solution in concentrated ether, filtration and evaporation.

Properties.—This alkaloid is colorless, tasteless, and odorless. It dissolves freely in alcohol, and is quite soluble in water. Its ordinary salts are very soluble, much more so than the alkaloid. The alkaloid in our hands formed glassy, amorphous layers upon evaporation of the solvents, and we failed to obtain crystals of it.

The hydrochlorate of the alkaloid from aqueous solution, formed definite crystals of radiating stars, tasteless and very soluble in water.

All alkaloidal reagents used by us gave prompt and copious reactions with solutions of either the alkaloid or its salts. Caulophylline does not possess decided sensible properties, and is not characteristic of the drug.

Medical History and Properties.—Preceeding the year 1813 this plant was unknown to medicine, although there is no doubt that it was employed by the peculiar specialists known as "Indian doctors." In the year 1813 Peter Smith (See note†, p. 141) issued an illiterate publication in the way of an advertisement, and among other substances, introduced Blue Cohosh, under the name, Squaw Root. He asserted that the Indian women made use of a decoction of the root, taking it regularly for a period of two or three weeks before the time for parturition, and that to it they ascribed their freedom from the difficulties common to the whites. He also stated that it was a valuable emmenagogue. This statement of Smith's was accepted by botanics, and the drug became a recognized remedy.[‡]

Rafinesque (1828)[§] accepts the drug as a valuable remedy, giving Smith credit for its introduction.

Howard, Beach, King, Kost, Scudder, and the representative writers of the Eclectic School of Medicine, have recognized Caulophyllum as a valuable remedy, and it has been largely used by Eclectics from the day of Beach. They credit Smith with its introduction, and use it for the diseases where he asserted it to be of value.

Griffith (1847)[‖] gives the plant a position, without commendation, upon the assertion of "empirics," stating, "It is unknown in regular practice."

The United States Dispensatory neglected it through eleven editions, introducing it in the appendix of the twelfth edition (1865), and adding but little since.

The literature of the Regular Medical profession contains but little, if anything, concerning Caulophyllum. Prof. Eric Sattler, M. D., intended writing the uses and history for our publication, but found that the drug has no record. The meagre notes we give in our general medical history embrace the sum and substance of Regular literature, and it may be accepted that Caulophyllum has been exclusively Eclectic and Homœopathic in its employment.

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[*] We also agree that commercial Caulophyllum is an uncertain substance, and it is more than probable that unless Prof. Mayer exercised the greatest of care, the drug he used was contaminated with other substances.

[†] Mr. Ebert would not corroborate Mayer's assertion, because he could not *crystallise* the alkaloid. We are now aware of the fact that several alkaloids have not been crystallized.

[‡] Some medical writers in recognizing the history of the drug use such expressions as "A late empirical writer," (See Hand, 1820) refusing to give the name of Smith, but, the fact remains. Perhaps only in the medical profession would writers of history presume to ignore the name of a discoverer because of prejudice.

[§] Medical Flora of the United States, Vol. I., p. 97.

[‖] Medical Botany, 1847, p. 114.

The uses of the drug in the Eclectic and Homœopathic Schools of Medicine are contributed to this publication by Professors King and Hale, as follows:

THE USES OF CAULOPHYLLUM IN THE ECLECTIC SCHOOL OF MEDICINE.—(Written for this publication by Prof. John King, M. D., Professor of Obstetrics and Diseases of Women, in the Eclectic Medical Institute of Cincinnati). —Caulophyllum thalictroides is a very valuable remedial agent that has been in use among Eclectic practitioners for many years past. It, undoubtedly, exerts a beneficial influence upon abnormal conditions of mucous membranes, as manifested in certain forms of stomatitis; indeed, my own first knowledge of the agent was in 1836, when I used it in decoction, quite extensively, alone or in combination with Hydrastis canadensis, as a local application in the treatment of aphthæ and similar affections of the mouth.

It has also been used with success in rheumatism—more especially the articular variety; also in flatulent and spasmodic colic, cramps, hiccough, and in epilepsy, due to diseased state of the female reproductive organs. Added to certain drastic purgatives, as aloes, podophyllin, etc., it will greatly diminish the tormina so frequently attending their action, and in most instances will entirely prevent it. Caulophyllin is more generally employed for this latter purpose. Certain writers have stated that it possesses diaphoretic, diuretic, and anthelmintic properties, but further observations are required, not only to determine these, but several other virtues that have been attributed to it.

Its more prominent properties appear to be, sedative, antispasmodic, and oxytocic; and, from its especial influences in these respects, upon certain maladies peculiar to the female generative organs, its use among Eclectic practitioners has become general in the treatment of several symptoms due to such maladies. Thus, it has been very efficacious in hysteria, not only having removed its attacks, but also any ovarian or mammary pain or irritation that was present. In arresting threatened abortion it has been found in every respect equal to Viburnum. In chronic corporeal or cervical endometritis, it has been very advantageously employed, as well as in uterine leucorrhea, amenorrhea, dysmenorrhea, etc., symptoms so frequently resulting from abnormalities of the uterus. In menorrhagia, so frequently attending uterine subinvolution, its continuous use for several weeks, has effected recovery when previous treatment had completely failed.

When used by delicate females, or those subject to prolonged and troublesome labors, for several weeks previous to the parturient period, it appears to impart tone and normal action to all the powers engaged in this important process, facilitating its progress, and relieving the woman of much suffering. For this purpose it is frequently administered in combination with other agents, and given in proper doses, two or three times daily.

During labor, when, from fatigue, debility, or impaired uterine nervous energy, the contractions become feeble, inefficient, or very severe and of a spasmodic character, or have entirely ceased, the administration of Caulophyllum in decoction, or even in powder, will be found preferable to Ergot, as the contractions aroused by its action are less violent and spasmodic than those effected by Ergot, and more nearly resemble the natural ones. In severe after-pains, more prompt and efficient relief will follow the use of *Caulophyllin*, than from any other agent, in doses of from two to four grains, administered, if necessary, every one, two, or three hours.

The tincture, fluid extract, specific tincture, and the preparation called "Caulophyllin," are chiefly employed by practitioners at the present day. Dose of the decoction or infusion (1 oz. root to 1 pint water), from two to four fluid ounces every three or four hours; of the tincture (3 oz. pulv. root to 1 pint alcohol), from ten to thirty drops, three to four times a day; of the fluid extract, from five to fifteen drops; of the specific tincture, three to ten drops; —the indications for which, are debility (irritability) of the nervous system with impaired muscular power; spasmodic muscular pains; colicky pains in epigastric and umbilical regions; pains in articulations; dull frontal headache; great thirst.

THE HOMŒOPATHIC HISTORY AND USES OF CAULOPHYLLUM AND CAULOPHYLLIN.—(Written for this publication by Prof. E. M. Hale, of Chicago, —author of "New Remedies,"—Prof. of Mat. Med. and Therapeutics, in the Chicago Homœopathic College).—It is a matter of some interest to note the history of this drug in the Homœopathic school. Prof. B. L. Hill, at one time Prof. of Surgery in the Eclectic College at Cincinnati, at a later date occupied the same chair in the Homœopathic College of Cleveland, O. While lecturing then, he occasionally lectured for other Professors, for he was a kind of universal genius. He delivered several lectures on obstetrics and diseases of women, and in those lectures, mention was made for the first time in any Homœopathic college, of the virtues of Caulophyllum, as well as Cimicifuga, Hydrastis, etc.

In 1868, I began a series of articles in the North American Journal of Homœopathy on "Indigenous Remedies," among which was one on "Caulophyllum in diseases of women." In this article I collected all that had been written on this plant by "Botanics" and "Eclectics," to which I added my large personal experience.

A few years later I re-wrote this article for my "New American Remedies," adding much clinical experience, and a "proving" by Dr. W. H. Burt, on himself. This proving did not, of course, throw any light on its gynecological properties, but some symptoms were evolved which showed some relationship to other members of the same genus—the Berberideæ. It caused rheumatic pains in the small joints and muscles, which showed its affinity with Jeffersonia; some mucous, membrane and renal symptoms—having some resemblance to Berberis, and some intestinal and hepatic irritation like that caused by Podophyllum, only in a mild degree.

Had I space I would like to make some observations on the qualities of plants of the same genus. A genus, like a human family, may show some analogous traits in each member, yet each member may have a very distinct personality. Lindley, Murray and Cullen have written on this subject, but none have discussed the subject in such a masterly manner as the late Prof. Tully, who was the most erudite and marvelously learned botanist and writer on Materia Medica which America has ever known.

Caulophyllum is one of a class of remedies whose virtues seem to have been well known to the aborigines of this country. They call it Squaw Root, by which name it is known to the common people. Early pioneers, lay, as well as professional, all bear witness to the high estimate placed on it by the Indians for the relief of the sufferings and weaknesses of the women of that race. It has another name, Blue Cohosh—the origin of which I have not been able to ascertain.

Its sphere of action, as near as can at present be stated, is not extensive, but confined to the small muscles and joints, the muscular tissues of the generative organs, and possibly the motor nerves and mucous membranes. The provings made do not throw much light on its general powers. Its clinical uses afford us almost all the data upon which we base our knowledge.

Its most prominent value seems to be its power of causing intermittent contractions of the gravid uterus, and possibly of the unimpregnated. In this it differs from Ergot, which causes, or tends to cause, persistent contractions. The remedies which most resemble it in this respect are Viburnum, Cannabis Indica, and Cimicifuga. It has become very popular with a portion of our school, for the following conditions:

1ST.—Deficient labor pains, when they do not appear with sufficient vigor and regularity, at full term, and during labor; when the pains have disappeared from exhaustion; when they are too severe and too painful, or are spasmodic. In the two first instances it should be given in doses varying from one-fourth grain of the Caulophyllin, crude, to a grain of the 1st or 2nd, frequently repeated; but in the last instance, to which condition it is primarily homœopathic, the dose should be from the 3d to the 6th, or higher.

I mention the active principle, because it seems to possess the desired powers of the medicine in a pleasanter form than the tincture, which, in its crude state, is quite irritating to the fauces. But the tincture can be used in about the same proportions, if necessary, substituting ten drops for each grain of Caulophyllin.

The same directions will answer for the dose in other conditions in which it is specific, namely:

2ND.—Spasmodic dysmenorrhœa, when the flow is natural in quantity and quality. This distressing condition is often cured by Caulophyllin, but to be successful, the medicine must be given several times during the week or two preceding the menses, as well as during the painful period.

3RD.—Spasmodic after-pains, in which it is indispensable.

4TH.—Spasmodic pains in the uterus, broad ligaments, etc., occurring at any time, from a cold, rheumatism, during pregnancy (false pains); also general, as well as local spasms, from the suppression of the menses or lochia.

As might be expected from its powers, which I have just enumerated, it is a powerful agent for the prevention of premature labor and miscarriage, provided the premonitions are pains of a spasmodic character.

The aborigines and earlier settlers claimed for it the power of preventing tedious and painful labors. This testimony has been substantiated by many prominent and trustworthy physicians of the Eclectic school, as well as of the Homœopathic. A few of our schools have denied it such power, but the weight of the evidence is against them. I am sure, from the observation of many years, that it actually prevents the unusual sufferings which many women undergo. I can testify to the singular fact, observed by many of our school, that many women who have taken it for such purposes have overrun their time to the extent, in some cases, of ten or twelve days. The cases referred to, however, all had very easy labors and a good recovery. My experience has been so uniform and conclusive on this point, that I do not hesitate to assert that it prevents not only a too painful labor, but it prevents those premature labors which are so common among the weakly women of this age.

We must not expect it to prevent painful labors (dystocia) in women who become advanced in life before they bear children, or in whom there exists any deformity of the pelvic cavity. Such cases are mechanical obstacles to easy, natural labors. Caulophyllum removes only abnormal functional causes. The method of giving it in such cases is to prescribe a few grains of the 2nd or 3rd trit., or a few drops of the 0 or 1st dil., three times a day, for the last two weeks previous to the expiration of the term. If, however, a premature labor is feared at the seventh or eighth month, it should be taken during the two weeks preceding those periods.

Caulophyllum has been recommended for rigid os uteri, but I believe the rigidity is overcome, not from any specific power on the circular muscles of the os, but from its general action on the uterus. Gelsemium and Belladonna are better for this condition.

If uterine displacements are attended by periodic, spasmodic pains, Caulophyllum will form a valuable auxiliary to Sepia, Lilium, Nux, or Belladonna.

In my second edition of "New Remedies" was recorded a case of paraplegia from retroversion, which the Caulophyllum was supposed to have cured. We need further confirmation, however, before we accept it as a remedy for such condition.

It seems to be homœopathic to rheumatism of the short muscles and small joints of the extremities, and a few cases of that character have been reported.

It is said to be indicated when spasmodic pains occur in the stomach, intestines, and other organs in sympathy with the same kind of pains in the uterus. There is no particular reason why they should always be in sympathy with that organ in order to render this remedy curative.

There have been no experiments, to my knowledge, or clinical data, which show the influence, if any, which this drug may possess on the quantity and quality of the menstrual flow.

In this respect it resembles Cimicifuga, which does not appear to increase or decrease the normal flow. Caulophyllum resembles Cimicifuga in many other things, viz.: its action on the muscles, especially those of the uterus, and the motor system of nerves. This is not the only species of the genus which resembles one of the Ranunculaceæ, for Berberis vulgaris closely resembles Hydrastis.

The Therapeutic Action of Leontin, (written for this publication by Prof. E. M. Hale, Prof. of Materia Medica and Therapeutics in the Chicago Homeopathic College). A few weeks ago Messrs. Lloyd sent me a few grains of this *glucoside*, and some of their one per-cent solution. If this really represents all the therapeutic properties of Caulophyllum it will become of great value to the medical profession.

I suppose from what I can learn of its potency, that one grain represents ten grains of Caulophyllin. It has the great advantage that it is devoid of the bitter, nauseous taste of the latter. I have used it in two cases with apparently very prompt and happy results:

1. A young lady habitually running a week or two beyond the normal time applied to me for some medicine to regulate her. I gave her Senecin 1x, with no results for a week. After waiting a few days I gave her Leontin, one per-cent solution. She took a teaspoonful at night. During that night the menses appeared, in usual amount, and painless.

2. A married woman missed her regular period. Not altogether, for she had a sudden flow of an hour or two on the day she should have been unwell. A week after she began to have a dirty, brown discharge, with some heaviness and pains in the back and groins. Sabina 2x and Secale 2x were given until a few days before the next period, but with no benefit. I then gave her Lloyd's one per-cent solution of Leontin, a teaspoonful every four hours. After the fourth dose expulsive pains came on and she soon expelled a fetus of five weeks. On examination I found a black, disorganized placenta, in the cervical canal. On its removal all pain and flowing ceased.

Another case illustrates its powerful medicinal action:

3. A married woman applied to me to restore her menses—overdue three weeks. She assured me that there was "no possibility of pregnancy." I gave her ʒii of the one per-cent solution, and ordered her to put it in ½ glass of water, and take a teaspoonful every hour. In a few days she returned saying she did not want any more of "that medicine," as, after each dose, violent labor-like pains occurred and lasted nearly an hour. She described the pains as distinctly intermitting, commencing in the back and going across the hypogastrium and down the vaginal regions. It caused no flow, and disappeared after the last dose. Here is a good picture of its pathogenetic effect. I shall

make use of it in labor whenever occasion requires. It appears to be applicable when Ergot would not be, for the present *dictum* of obstetricians is not to use Ergot while anything remains in the uterus. It is indicated in feeble, ineffectual or absent labor pains, but in hemorrhage after labor I still prefer Ergot. The above refers to the physiological uses of Leontin. In such cases appreciable doses must be used. These doses will vary from ʒi of the solution hourly to five or ten drops.

But its uses according to the law of *Similia* are in another direction. As a homeopathic remedy for labor-like pains, uterine cramps and spasms, dysmenorrhœa, false-pains during pregnancy, and severe afterpains, it will doubtless prove effectual. I have found it so in several cases of dysmenorrhœa, both neuralgic and spasmodic. In such cases the proper method of administration is to put 10 or 15 drops of the one per-cent solution in half a goblet of water, and prescribe teaspoonful doses. An elegant preparation for homœopathic use is a trituration (centessimal) of the pure crystallized glucoside. I have in a few cases used the 2° cent. trit., in uterine pains, with good success. In my paper on Caulophyllum I stated that we had yet no positive proof that it actually increased the *quantity* of the menstrual flow. Since that was written I have been informed by Dr. S. Leavitt, of this city, that he is convinced from large experience with the tincture that in material doses it does not have this effect. I am now convinced that Leontin has this effect. Not only does it increase the amount of the flow, but it will bring it on before the usual time.

Surely such a powerful drug as Leontin must have a wider sphere of action than the generative organs of women. It ought to prove useful in many spasmodic affections of hollow organs, notably the heart, stomach and bladder.

THE ACTION OF LEONTIN AS AN EMMENAGOGUE.—(Written for this publication by Thad A. Reamy, A. M. M. D., Prof. of Clinical Gynecology, Medical College of Ohio, Gynecologist to the Good Samaritan Hospital and to the Cincinnati Hospital.)

Introductory to some clinical observations as to the value of Leontin as an emmenagogue. The following general remarks on Amenorrhœa are appropriate.

Amenorrhœa—May be divided into three classes depending upon its etiology,

1st. The obstructive or mechanical variety due to abnormality of the organs concerned in the menstrual function, conditions which may be congegenital or acquired.

2d. Symptomatic Amenorrhœa where menstruation does not appear or ceases because of some constitutional condition, as anæmia, scrofula, phthisis, etc., or pathological state of some organ remote from the genital system.

3d. Amenorrhœa sometimes occurs when the cause cannot be found in either of the above classes and may, for convenience, be called functional or idiopathic.

As a rule, the importance of amenorrhœa *per se* is greatly exaggerated by its subjects and their friends. The cessation of menstruation in itself is worthy of attention only when other important disturbances are induced as a result. In cases of the symptomatic variety, which are a large majority, the underlying condition only requires treatment. The removal of the cause will usually restore the menses. Only evil can result from use of emmenagogues when amenorrhœa is due to phthisis.

The cessation of the regular menstrual flow in such cases is conservative and should not suffer interference. Those subjects who do not menstruate because of some congenital or acquired malformation of the genital organs will usually find relief only in surgery.

In cases of the so-called functional or idiopathic type, lies the proper field for emmenagogues, remedies having a selective action upon the ovaries and uterus by promoting the menstrual function. The rational clinical classification of cases is therefore of the utmost importance in treatment, and a clear conception of such cases as are properly functional or idiopathic is essential to the intelligent employment of remedies.

The differential diagnosis of the class of amenorrhœa to which a given case belongs is usually not very difficult when careful and patient inquiry into its etiology is instituted.

The first class is readily determined by a physical examination which is perfectly justifiable in suspected cases in married women. In the unmarried the diagnosis may be inferred by exclusion of the second and third classes, and under such circumstances a strong presumption of genital malformation would warrant the necessary examination. But the practice, too prevalent, of subjecting young misses to manual and instrumental examination of sexual organs on trivial pretexts is surely to be condemned. It is within the knowledge of all, that physicians are urged by mothers to prescribe for girls who have not yet arrived at the proper state of development.*

Those cases of amenorrhœa in which the menstrual suppression is but a symptom must be diagnosed and the discovery of the cause decides the character of the treatment indicated.

So-called functional or idiopathic amenorrhœa pre-supposes a normal condition of the ovaries and uterus, without any local pathological condition. The function of the endometrium in discharging a periodical flow of blood is arrested from no apparent fault of its own. In not a few cases the trouble is due to disease of the endometrium, or rather to the products of pre-existing inflammation. When such disease is found it must of course be removed. The ovaries are presumably able to furnish the exciting nervous stimulus which is claimed to be necessary to the discharge. The

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*It is too often the belief that when a girl has arrived at the age of twelve or thirteen years, and especially if there is some mammous development, she should promptly menstruate. Nothing could be more fallacious. Again. when a girl has menstruated once or twice, should the function be suspended for a period or two, she is by the mother regarded as an invalid, whereas irregularity during the period of menstrual development is the rule and should not be interfered with, except for due cause

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